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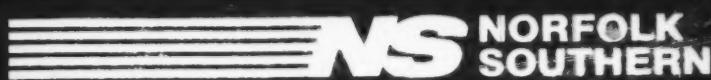
Cov. 1, p. 4-5, 14, 17, 60.

November 1983

RAILWAY AGE

...for the new age of railways

Baltimore Metro:
Worth waiting for



A winning combination

NW

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ANDREA SCHWARTZ
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TOFC/COFC: Setting the pace for recovery

How to stretch your drainage dollars

RAILWAY AGE

...for the new age of railways



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The consolidation of Southern and Norfolk & Western, which was carefully planned to minimize difficulties, is progressing ahead of schedule.

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As piggyback evolves into a major profit-maker, railroads are reconfiguring their terminals to accommodate it. Meanwhile new equipment keeps coming out.

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A wide variety of intermodal equipment can be found at Burlington Northern's Cicero Yard, which is quickly being transformed into a major piggyback center.

57 **Good drainage now saves headaches later**

Although keeping track dry and stable is an inexact science, the rewards of success are great—and the penalties for failure can be severe.

62 **Baltimore keeps it simple**

The first section of Baltimore's Metro is finished. Maryland MTA is fully prepared to begin operations Nov. 21, and no problems are expected.

66 **Suppliers ante up to tell the railroad story**

Railroad suppliers, through the five-year-old American Railroad Foundation, are supporting the effort to increase public awareness of the new railroads.



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Inside

Some good news for builders...

On Oct. 14, 167,774 serviceable freight cars were still in storage, waiting for loads. But not one of them was a Trailer Train piggyback car. On Oct. 6, all serviceable Trailer Train TOFC/COFC cars were on the road working—the first time that has happened since November 1979. That statistic becomes all the more impressive when you consider that over the last five



LUTHER S. MILLER

years, the utilization of Trailer Train intermodal equipment has increased from 165 miles per car day to 205 miles, as Senior Editor Gus Welty notes in our cover story (p. 44).

It is not surprising, then, that Trailer Train has some major equipment acquisition plans. TT proposes to buy 2,000 piggyback platforms next year, 3,000 in each of the three following years, and 4,000 in 1988—good news for those builders who have been investing their R&D money in new intermodal designs (or at least for those whose designs survive the shakeout that is now under way).

...and some not-so-good news.

For builders of other types of freight equipment, the news continues to be bleak. The car-surplus figure of a couple of weeks ago is a big improvement over that of ten months ago, when more than 300,000 cars lay idle. But most railroads still have more than enough cars to meet their needs, and no enormous upturn in orders is seen for another year or so.

At the RPI's 75th annual meeting in Washington Oct. 20, four railroad chiefs were asked during a meet-the-press panel about their 1984 capital-spending plans. Burlington Northern's Walter A. Drexel said BN, which maintained a large capital program this year, would have an equally large one in 1984—but it would be earmarked mostly for fixed plant. Southern Pacific's Denman K. McNear observed that SP's 1983 program was bigger than 1982's and 1984's would be bigger than 1983's—but again the big dollars would go into roadway and other fixed facilities. Harold H. Hall made it a thrice-told tale: Norfolk Southern's 1984 budget, he said, would be bigger than that of 1983—but comparatively little would go for rolling stock. Grand Trunk's John H. Burdakin said GT's '84 budget would be about the same as this year's—but it would contain little if anything for rolling stock.

Harold Hall did make the point that carbuilders should not be overly discouraged by all of those cars in storage; many of them, he said, are going to stay there and will need replacing. He also suggested that as more carrier/shipper contracts are negotiated, a new market may develop for specialty cars.

Market Outlook

Facilities

Burlington Northern: Is installing new MIR-6 microwave radios between Mendota, Ill., and Lincoln, Neb. The equipment was provided by Rockwell's Collins Transmission Systems Division under a \$660,000 contract.

Union Pacific System: Will build a new motor-vehicle unloading facility on Missouri Pacific at Westfield, Tex., north of Houston. The six-track ramp will accommodate 60 multilevel autorack cars; three self-propelled multilevel unloading machines and an A-frame will be used in the operation. In addition, the 75-acre facility will have parking space for 2,520 motor vehicles and 41 ramp spots for loading vehicles onto haulaway rigs.

Washington Metropolitan Area Transportation Authority: General Railway Signal is the apparent low bidder at \$3.7 million for signaling WMATA's new West Falls Church Yard, a multi-track rapid transit car storage and repair facility. Shipment of equipment is scheduled for late next year.

Equipment

American President Lines: Ordered 315 well platforms (63 five-unit intermodal cars) for double stacking from Budd. Deliveries are to be completed by next May.

Intermountain Power Agency: Awarded a contract valued at \$8.8 million to Ortner Freight Car Co. for the supply of 182 Rapid Discharge coal cars. The contract includes options to purchase additional cars, and to specify aluminum rather than steel construction. The cars will be assembled into two unit trains for moving coal from IPA's several Utah mines to the new Intermountain Generating Station now under construction near Delta, Utah. The first train is to be delivered in December 1984 and the second two years later.

Long Island: Is installing, in its fleet of diesel-hauled coaches, new seats de-

Freight cars and locomotives

	DELIVERED		July 1983	Eight months 1983	
	1983	1982		1983	1982
Built new by carbuilders	469	992	260	3,016	12,973
Built new in RR shops	0	68	0	200	1,054
Built new—total	469	1,060	260	3,216	14,027
Rebuilt	71	98	29	100	900
TOTAL DELIVERED	540	1,158	289	3,316	14,927
Locomotives (new and rebuilt)	22	25	11	158	322

	ORDERED		July 1983	Eight months 1983	
	1983	1982		1983	1982
To be built new by carbuilders	287	373	934	3,748	5,175
To be built new in RR shops	0	0	0	3	0
To be built new—total	287	373	934	3,751	5,175
To be rebuilt	0	0	0	100	0
TOTAL ORDERED	287	373	934	3,851	5,175

	ON ORDER AND UNDELIVERED		August 1	Average Backlog	
	September 1 1983	September 1 1982		1983	1982
To be built new by carbuilders	3,752	6,217	3,894	4,173	9,463
To be built new in RR shops	3	612	3	34	931
To be built new—total	3,755	6,829	3,897	4,207	10,394
To be rebuilt	0	0	71	34	352
TOTAL ON ORDER	3,755	6,829	3,968	4,241	10,746
Locomotives (new and rebuilt)	157	101	167	116	173

Source: Transportation Division, AAR

signed and supplied by Coach and Car Equipment under a \$4.8-million contract.

Santa Clara County Transportation Agency: Ordered 50 light rail cars from Urban Transit Development Corp. of Toronto at a total cost of \$48 million. Unsuccessful bidders were Bombardier, Budd, Kinki Sharyo, Mitsubishi, and Siemens-Allis. The cars will be used on a 20-mile line scheduled to go into service in 1986. It will extend from the southern residential areas of San Jose to the northern industrial parks of San Jose and the city of Santa Clara. The cars will be built at Thunder Bay, Ont., by a joint venture 80% owned by UTDC and 20% owned by Hawker Siddeley Canada.

Shintech, Inc.: Leased 50 5,800-cubic-foot-capacity covered hopper cars for plastics service from Thrall Car for delivery in November. The cars, which do not have a centersill, are equipped with Edsco Vac-U-Matic outlet valves and a new Dev-

Mark stainless steel hatch cover design.

Stroh Brewery Co.: Will place in service 50 60-foot Fruit Growers Express mechanical refrigerator cars which have been equipped by FGE with an 18,600-gallon stainless steel container for transporting liquids in a consistently temperature-controlled environment. The joint venture with FGE represents an investment of more than \$2 million by the brewer; in addition, Stroh will spend \$500,000 to construct a rail facility near its Detroit plant on Grand Trunk Western.

Vancouver Rapid Transit System: Is using two ROPCO HD 1580 Magnum Speedloaders, each with a weight capacity of 150,000 pounds, in construction of elevated lines. The Speedloaders will lift guideway beams weighing 100 metric tons each onto specially-designed trucks for transportation to the construction site. They are also being used in beam production to transport reinforcing steel and sections of the molds.

Market Indicators

DRI Railroad Industry Monitor

The government report that GNP grew at a 7.9% annual rate for the third quarter capped a month of good economic news. New car sales are moving well, consumer spending is strong, and the residential construction picture remains good despite the expected drop in housing starts.

The budget deficit and possibility of foreign loan defaults are dark clouds on the horizon, but they do not at this point seriously threaten the recovery.

For the railroads, the major piece of unsettling news is the sluggishness of the recovery in steel. During the recession the economy has seen a decline in steel intensity—the amount of steel consumed for any given level of GNP. Part of this change may simply reflect shifts in inventories and import penetration, but a real shift in the struc-

	1983:2	1983:3	1983:4	1984:1	1984:2	1984:3	1984:4
Economic Indicators (Annualized rates)							
Real GNP (% change)	9.7	7.0	5.1	4.8	4.7	4.4	3.5
Industrial Production (1967 = 1.0)	1.44	1.51	1.53	1.56	1.57	1.59	1.61
Housing Starts (mil. units)	1.68	1.83	1.72	1.89	1.74	1.79	1.80
Retail Car Sales (mil. units)	9.2	9.4	10.0	10.3	10.6	10.8	10.8
Raw Steel Production (mil. tons)	21.7	23.3	25.5	27.8	28.4	26.4	27.0
Total Class I Rail Traffic (millions of tons)							
	312.8	330.2	306.0	314.4	333.9	338.0	333.5
Key Commodities							
Grain	26.7	36.8	29.1	31.8	30.6	27.5	29.9
Coal	118.0	124.0	115.5	125.0	127.4	131.0	132.9
Pulp & paper	9.4	9.3	9.2	9.5	9.5	9.3	9.1
Chemicals	24.0	24.6	24.1	26.7	25.7	25.0	25.0
Motor Vehicles	5.3	4.7	5.3	5.2	6.0	4.8	5.5

Source: Data Resources, Inc., Oct. 24, 1983

ture of the economy appears to have taken place. As a result, the Steel Service at Data Resources has revised downward its forecast

of steel production through the end of 1984, spelling additional trouble for the roads whose traffic base is tied to steel.

Revenue freight carloadings

Commodity	Oct. 15 week	% change from 1982	Oct. 8 week	% change from 1982	Oct. 1 week	% change from 1982	Sept. 24 week	% change from 1982
Grain	32,548	61.0	35,254	65.3	28,688	20.5	29,808	98.0
Other farm products	6,117	33.6	3,825	7.5	3,941	39.4	3,992	75.5
Metallic ores	17,134	27.7	16,178	52.9	17,638	53.5	13,376	14.6
Coal	109,759	(3.1)	109,478	(1.7)	110,327	(7.7)	109,391	31.5
Crushed stone, gravel and sand	12,047	26.3	11,813	16.7	11,868	16.7	11,638	63.1
Nonmetallic minerals	14,062	41.0	11,423	14.1	13,233	32.6	13,114	68.0
Grain mill products	12,001	0.5	11,921	(0.9)	12,904	4.8	12,658	25.9
Food and kindred products	12,203	(9.9)	12,131	(9.6)	12,968	(8.6)	12,568	19.2
Primary forest products	14,543	6.0	14,612	(1.1)	15,386	0.9	14,492	30.9
Lumber and wood products (except furniture)	7,356	20.7	7,024	21.1	7,830	12.4	7,374	55.2
Pulp, paper and allied products	14,333	(5.0)	15,271	(0.3)	16,142	(0.1)	15,518	13.6
Chemicals and allied products	24,373	17.0	24,839	19.9	27,220	20.4	24,711	36.2
Petroleum products	4,539	(0.6)	4,725	4.0	4,737	(3.3)	4,902	43.1
Stone, clay and glass products	11,502	15.0	11,810	8.4	12,240	6.5	11,824	32.4
Coke	4,741	1.3	4,887	4.6	5,234	17.9	5,367	35.6
Metals and products	8,809	34.7	8,168	26.3	9,679	20.3	8,595	37.2
Motor vehicles and equipment	19,394	47.8	19,817	59.0	19,539	56.2	18,974	63.1
Waste and scrap materials	9,236	22.5	8,911	20.5	9,395	16.8	9,019	55.2
Forwarder and shipper assn. traffic	10,319	29.1	10,740	30.2	11,067	33.1	10,312	53.6
All other carloads	54,466	18.7	57,040	19.7	58,184	17.5	55,932	54.2
LCL traffic	325	(68.9)	311	(71.9)	337	(71.0)	342	(66.6)
Total Cars Loaded	399,807	13.1	400,178	13.5	408,557	9.3	393,907	41.0

Estimated revenue ton-miles (billions)
41 weeks

1983
650.4

1982
636.5

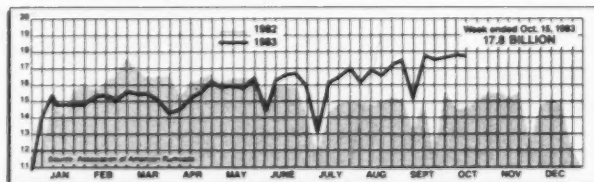
% change from 1982
2.2

Piggyback loadings

Week ended	Cars loaded 1983	% increase from 1982	Trailers/containers 1983	% increase from 1982
September 17	49,888	23.8	87,661	23.9
September 24	50,931	53.6	88,936	50.8
October 1	52,219	22.5	92,024	19.4
October 8	50,800	23.6	89,160	20.9
Cumulative total, 40 weeks	1,779,358	21.5	3,074,604	18.6

Rail freight traffic trends

Billion ton miles (Estimated)



because the subgrade drains less freely than the ballast.

And so it goes. Ballast pockets, far from representing points of strength, so weaken the subgrade as they soak it that they grow deeper and deeper, sometimes burrowing down as much as twenty feet. When water collected in the pocket freezes the result can be even more spectacular.

● **Design it right.** It doesn't have to work out that way, of course. While its practitioners must work with what at best are hardly ideal engineering materials, the principles of soil mechanics are well enough established to permit designing around most recognized problems. With appropriately different load distributions, subgrade design calculations for highways, airport runways and railroads are similar enough to support reasonably high-confidence transfer of the fruits of civil engineering training, research results and field experience among the different applications.

A good example of problems recognized and controlled is the Southern's Spencer Yard at Linwood, N.C. Constructed in 1977-79 in an area including several open backwaters and

acres of unstable native soils, and during what happened to be an extended period of unusually wet weather, the foundations for Spencer's 65 miles of track absorbed 5.6 million cubic yards of grading and several miles of drainage lines by the time the recommendations of the engineers for overcoming the physical problems of the logistically ideal site were cranked into the plans. Then came 870,000 tons of crusher-run granite as a sub-base for 225,000 tons of granite ballast, with several acres of geotextile fabric interposed in the more difficult areas for good measure.

It can be done: After four years in service, track stability remains excellent and Southern's Vice President-Engineering H.L. Rose says "the results are worth every penny we put into it."

● **Geotextiles—how do they work?** Within the last decade a lot of cloth has gone into railroad track, frequently with benefits in alleviating conditions at trouble spots more than sufficient to make up for having rug salesmen infesting the industry. How do geotextiles work? At the interface between ballast and subgrade a fabric properly chosen (this may take some doing, since there are at least

11 manufacturers in the field at the moment, some with more than one line of product) can in theory attack the problem in several ways:

Tensile strength of the fabric may improve the load-spreading properties of the ballast, increasing the effective ballast depth in terms of subgrade pressure at the interface. Filtering action of the fabric may impede migration of the subgrade into the ballast, preserving its effectiveness. The fabric itself may serve as a drain by wicking out some water from ballast and subgrade.

To accomplish these good things of course the material must survive sunlight, water, track machinery and sharp ballast to a considerable degree. As is the case with anything multipurpose—especially where some of the possible benefits are contradictory (wicking vs. filtration, for example)—it's difficult to determine exactly what combination of properties should best fill the bill in any particular situation, and the applicability or validity of test procedures for some characteristics remains to be fully established. An AREA task force is working with representatives of some of the manufacturers on this matter.

Going for geotextiles is the fact that the

Roadway train accidents—down, irregularly

The consequences of drainage problems most directly visible—in both newspapers and FRA reports—are slides, washouts and major roadbed displacements occurring just ahead of or under a train. These you can count, dissect and price out, at least in terms of damage to roadway and equipment. An uncounted number of washouts and slides are detected in time, by slide fences or other heroes, and don't show up in the accident figures; as the accompanying table indicates, those that aren't detected and do show up in

the statistics account for such a small number of reportable mishaps that their number and cost, even on a national basis, bounces around from year to year. The total cost is also, even in a relatively bad year such as 1982, modest in comparison to that of such a catastrophe of geography and weather as this May's \$40 million mud slide on the Rio Grande in Utah (RA, Sept., p. 42).

More consistent, and showing a continuing downward trend are the number and cost totals for train accidents in the "Roadbed settled

or soft" category—sudden failures, usually in fills, which are almost always associated with the presence of excess moisture somewhere in the subroadbed. Down by almost a factor of three from the 1979-80 average, 1982 damage totaled only a little over \$1 million; savings from anticipating and wiping out the causes of all of the sudden failures couldn't by itself pay for a whole lot of improved drainage.

Far more significant in total are those less direct effects of poor drainage which can occur anywhere along the railroad:

—Poor drainage results in an unstable subgrade.

—Unstable track results in poor surface, line and gauge.

—Fouled ballast pumps mud, particularly at joints, accelerating rail-end batter and loosening fastenings.

—Ties deteriorate more quickly when wet.

These roadbed-induced effects can show up as train accidents which result directly from defects within the "track geometry" category. Wide gauge from missing or defective ties, incorrect superelevation and irregular cross level are major contributors to a frequency and cost total which is also on an encouragingly downward trend, in line with the industry-wide improved track condition of recent years. However, it's apparent that these manifestations of track deterioration often properly traceable to poor drainage are right up there in total with such more often publicized track-related accident causes as rail and joint bar defects. Further reducing these could buy a lot of drainage.

Track-related accident statistics summary (U.S.)

(Number of train accidents/reportable cost, \$ million)

	1979	1980	1981	1982
Roadbed settled or soft	129/ \$2.8	111/ \$3.6	80/ \$1.9	60/ \$1.2
Washout/slide etc. track damage	64/ \$7.5	31/ \$3.2	24/ \$1.7	36/ \$9.5
Other roadbed defects	20/ \$0.6	14/ \$3.5	7/ \$0.1	13/ \$0.4
Subtotal, roadbed defects	213/ \$11.0	158/ \$10.4	111/ \$3.9	109/ \$11.1
Subtotal, track geometry defects	1,803/ \$43.5	1,575/ \$48.4	1,048/ \$33.5	751/ \$28.0
Total, defects in track, roadbed and structures	4,050/ \$110.5	3,482/ \$108.0	2,273/ \$79.9	1,768/ \$83.1

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December 1983

RAILWAY AGE

...for the new age of railways

Miami Metrorail:
Countdown to startup

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1983 Review
1984 Outlook

RAILWAY AGE

...for the new age of railways



Cover: Southern Pacific's piggyback operations in Houston, photographed by Roy Blanchard. 1984 Outlook, Page 32.



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A pattern of sustained, slow growth is in prospect as railroads catch up with the rest of the economy in pulling out of the Great Recession of the '80s.

38 1983 Review: Recovery, at last

When the turnaround finally came, railroads were in a good position to take advantage of it, thanks in large part to deregulation and megamergers.

45 Cabooseless operations: Getting ready

As the AAR prepares its final guidelines, railroads and suppliers are working on devices that will communicate rear-end information to the locomotive cab.

48 Do premium trucks pay off?

Cost/benefit ratios are hard to establish. But available evidence suggests that the opportunity is there for suppliers who can reduce the truck weight.

52 Miami Metrorail: Countdown to startup

Equipment shortages and structural problems have put opening day on hold. February '84 is now the tentative target date for revenue service.

57 Misfits Into retrofits

All over the country, obsolete cars are being converted into intermodal carriers. Tank cars and covered hoppers could be next on the list.

61 Contract Locomotive Repair Directory

Railway Age's third annual survey has identified 59 companies performing repairs at 82 U.S. shops; plus 5 companies with 12 shops in Canada.

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Inside

A happy new year? Yes—and no

The freight railroads will close the books on 1983 with a small profit, a wealth of experience in making ends meet during tough times, and high hopes for a happier new year. Nobody expects business in 1984 to go off the charts, but there is a reasonable expectation that a period of sustained and stable growth lies ahead. The railroad outlook as sketched by Senior Editor Gus Welty in this issue's cover story (p. 32) is one that should satisfy all but the most foolish optimists.

All, that is to say, except those equipment suppliers for whom the deep chill of recession lingers.

Worst hurt have been the builders of freight cars and freight-car components. They are coming out of a year that has seen only around 5,000 new cars delivered; they're looking at a new year that may see deliveries rise to 13,000—still nothing to write the stockholders about.

For locomotive builders, the picture is a little better, and for track and C&S suppliers, the picture is a lot better. Early indications are that plant spending will be up across the board.

As for the carbuilding business, the situation was eloquently summed up by one supplier who told Gus, "I keep seeing a light at the end of the tunnel—but the tunnel keeps getting longer."



LUTHER S. MILLER

Railroading: The long and the short of it

In the book-publishing world, you will find no shortage of railroad titles—especially if what turns you on are tomes celebrating, in glorious color and lugubrious prose, the past glories of passenger and steam railroading. Less easy to come by on the pre-Christmas lists are books relevant to present-day railroading; but there are two at hand which merit comment.

One is the 1983 edition of "The Economic ABZ's of the Railroad Industry." It contains the most complete and most recent statistical profile of Class I railroads available anywhere. It is a stapled document of some 120 pages, and it is not impressive in format; but don't judge this book by its cover. From the first chart (which mode moves how much freight) to the last table (average trips per year by car type), it is an invaluable and unduplicated source of information. It can be had for \$25. Inquiries should be directed to Publications, Economics and Finance Department, AAR, 1920 L St., N.W., Washington, D.C. 20036.

The other book at hand is called "Starting a Short Line." It was written by R. Lawrence McCaffrey, Jr., and Peter A. Gilbertson, two lawyers with considerable experience in the field, and published in cooperation with the American Short Line Railroad Association. In 163 tightly-written, no-nonsense pages, it provides a wealth of guidance for shippers and others who are contemplating getting into the short-line business. It is available for \$23 from the American Short Line Railroad Association, 2000 Massachusetts Ave., N.W., Washington, D.C. 20036.

Market Outlook

Equipment

Conrail: Ordered 60 new diesel-electric units from General Electric valued at \$75 million, and 40 units from General Motors' Electro-Motive Division valued at \$48 million, all for second quarter 1984 delivery (p. 25).

Norfolk Southern: Ordered 26 diesel-electric units from General Electric at an unspecified cost (p. 25).

People's Republic of China: Entered into an agreement with General Electric for the supply of 220 heavy-duty diesel-electric freight locomotives to be built at Eria, Pa. (p. 25).

Port Authority Trans-Hudson:

Awarded a contract to Parsons, Brinckerhoff, Quade & Douglas to draw up technical specifications for rehabilitation of 248 PA-series cars that originally went into service between 1965 and 1972. Under an earlier contract, PBQ&D determined that major work was needed on trucks, propulsion control systems, door controls, public address systems, and floor components.

Facilities

New Jersey Transit: Has engaged Edwards and Kelcey, an engineering and planning firm based in Livingston, N.J., as prime consultant for design of the electrification and modernization of 16 miles of the North Jersey Coast Line (NJCL) from Matawan south to Long Branch. The project is estimated to cost \$70 million to \$80 million. Edwards and Kelcey performed a similar role in the electrification and modernization of the five-mile line north from Matawan to South Amboy; that section, which went into operation last year, marked the first new passenger-line electrification in New Jersey in more than 45 years. NJCL operates for 65 miles between Bay Head, N.J., on the Jersey Coast and Penn Station, New York City (including 20 miles in Amtrak's electrified Northeast Corridor). Completion of the new project will bring electrified service to passengers on the northern 50 miles of the route; diesel-hauled coaches will continue to service the southern end.

Freight cars and locomotives

	DELIVERED		September 1983	Ten Months	
	October 1983	October 1982		1983	1982
Built new by carbuilders	736	650	458	4,210	14,536
Built new in RR shops	0	240	2	202	1,348
Built new—total	736	890	460	4,412	15,884
Rebuilt	0	147	0	100	1,186
TOTAL DELIVERED	736	1,037	460	4,512	17,070
Locomotives (new and rebuilt)	43	31	37	198	388

ORDERED					
To be built new by carbuilders	642	134	416	4,806	5,841
To be built new in RR shops	0	750	0	2	750
To be built new—total	642	884	416	4,808	6,591
To be rebuilt	0	0	0	100	600
TOTAL ORDERED	642	884	416	4,908	7,191

	ON ORDER AND UNDELIVERED		October 1 1983	Average Backlog	
	November 1 1983	November 1 1982		1983	1982
To be built new by carbuilders	3,368	4,710	3,756	4,050	8,575
To be built new in RR shops	0	573	0	28	858
To be built new—total	3,368	5,283	3,756	4,078	9,433
To be rebuilt	0	314	0	27	359
TOTAL ON ORDER	*3,368	5,597	3,756	4,105	9,792
Locomotives (new and rebuilt)	128	86	158	121	155

*Due to revisions and cancellations of some orders, the November 1, 1983 backlog has been reduced by 294 cars.
Source: Transportation Division, AAR.

Estimated ownership—all revenue freight cars

October 1, 1983 vs. October 1, 1982									
	Box	Covered Hoppers	Gondola	Hopper	Flat	Refr.	All Others	TOTAL	
Class I RRs	1983 275,799	164,655	130,400	286,121	84,440	54,441	22,315	1,018,171	
	1982 287,389	169,263	137,079	297,629	87,743	56,443	23,460	1,059,006	
Class II & S&T Cos.*	1983 49,771	9,826	10,137	10,561	5,045	3,334	2,997	91,671	
	1982 52,730	9,402	10,676	12,998	4,741	3,407	3,373	97,327	
Railbox-Railgon	1983 15,089		3,998					19,087	
	1982 24,930		3,999					28,929	
RRO&C**	1983					5,204		5,204	
Refgs.	1982					3,866		3,866	
Private	1983 553	128,542	27,870	21,400	53,650	1,926	184,641	418,582	
	1982 524	129,878	27,735	21,309	52,749	5,664	190,250	428,109	
GRAND TOTAL	1983 341,212	303,023	172,405	318,082	143,135	64,905	209,953	1,552,715	
	1982 365,573	308,543	179,489	331,936	145,233	69,380	217,083	1,617,237	

*Class II railroads and switching terminal companies.
**Railroad owned and controlled refrigerator car lines.
Source: Transportation Division, AAR.

Market Indicators

DRI Railroad Industry Monitor

What can the railroad industry look forward to in 1984? Next year should be a good year for business, with housing starts averaging 1.7 to 1.8 million units and auto sales rising to 10.4 million. Industrial production will continue to grow, and recent strength in non-residential construction and nondefense capital spending should continue into next year.

Rail traffic will reflect the strength of the economy. After a seasonal downturn in the first quarter, rail traffic should climb to an annual rate of 1.35 billion tons per year. This is 90 million tons above the 1982-83 rate, although still 8% below 1981. Grain traffic will fall sharply next year in the wake of this year's drought-reduced harvest, but substantial increases in coal and chemical traffic will make up for this loss.

	1983:2	1983:3	1983:4	1984:1	1983:2	1984:3	1984:4
Economic Indicators (Annualized rates)							
Real GNP (% change)	9.7	7.9	5.4	5.1	4.7	4.4	3.4
Industrial Production (1967 = 1.0) ..	1.44	1.52	1.57	1.59	1.61	1.63	1.64
Housing Starts (mil. units)	1.68	1.79	1.67	1.69	1.78	1.85	1.72
Retail car sales (mil. units)	9.2	9.3	9.9	10.1	10.4	10.7	10.7
Raw steel production (mil. tons) ...	21.7	23.3	25.5	27.8	28.4	26.4	27.0
Total Class I Rail Traffic							
(millions of tons)	312.8	329.9	326.1	318.0	337.8	337.4	338.8
Key Commodities							
Grain	26.7	36.8	35.1	32.8	30.6	27.5	29.9
Coal	118.0	124.0	123.2	120.8	128.6	129.4	136.8
Pulp & paper	9.4	9.3	9.2	9.5	9.6	9.2	9.1
Chemicals	24.0	24.6	25.2	27.1	26.4	25.2	25.4
Motor Vehicles	5.3	4.7	5.5	5.4	6.3	4.8	5.7

Sources: Data Resources, Inc., Nov. 12, 1983

Revenue freight carloadings

Commodity	Nov. 12 week	% change from 1982	Nov. 5 week	% change from 1982	Oct. 29 week	% change from 1982	Oct. 22 week	% change from 1982
Grain	29,763	14.7	33,624	17.1	30,259	5.3	30,322	26.1
Other farm products	5,009	(25.4)	5,516	(17.7)	5,615	(15.2)	6,255	31.0
Metallic ores	18,111	40.5	18,779	62.1	17,722	51.9	20,758	72.0
Coal	109,383	4.5	113,357	4.8	109,523	1.3	114,617	3.4
Crushed stone, gravel and sand	11,206	15.0	11,211	15.0	11,182	12.6	11,321	16.4
Nonmetallic minerals	11,225	17.4	11,597	31.0	13,347	43.7	12,805	35.7
Grain mill products	10,357	(10.9)	10,939	(8.4)	11,438	(4.9)	12,022	(3.5)
Food and kindred products	11,266	(11.6)	11,985	(10.6)	12,197	(12.0)	12,282	(9.0)
Primary forest products	15,034	0.2	15,431	5.1	15,020	2.4	14,904	0.3
Lumber and wood products (except furniture)	7,172	17.7	7,298	19.4	7,922	18.6	7,421	16.3
Pulp, paper and allied products	14,734	(2.1)	15,019	(4.5)	14,950	(8.1)	15,147	(3.9)
Chemicals and allied products	24,469	22.5	24,512	17.3	24,777	17.0	24,628	21.0
Petroleum products	4,686	4.7	4,900	7.4	4,744	(1.9)	4,797	0.8
Stone, clay and glass products	11,231	17.6	11,629	15.9	11,738	16.9	11,557	13.0
Coke	5,066	45.8	5,205	38.8	5,180	41.5	4,940	18.6
Metals and products	8,326	19.9	8,703	21.0	9,389	25.8	8,840	25.2
Motor vehicles and equipment	19,743	55.2	19,484	51.0	20,287	41.8	19,795	40.1
Waste and scrap materials	9,354	26.4	9,055	23.1	9,081	13.7	9,014	14.5
Forwarder and shipper assn. traffic ..	10,083	36.2	10,282	30.6	10,734	29.6	10,258	27.7
All other carloads	54,723	20.8	57,078	21.6	57,982	19.6	57,248	21.3
LCL traffic	261	(77.0)	300	(72.3)	262	(77.0)	286	(74.3)
Total Cars Loaded	391,202	12.3	485,984	13.3	483,349	18.4	489,217	14.1

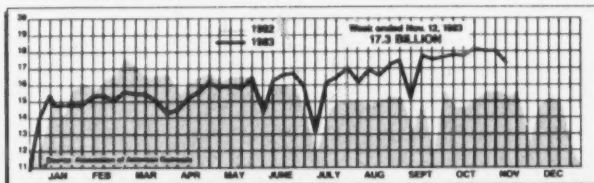
Estimated revenue ton-miles (billions)	1983	1982	% change from 1982
45 weeks	722.0	699.6	3.2

Piggyback loadings

Week ended	Cars loaded 1983	% increase from 1982	Trailers/ containers 1983	% increase from 1982
October 15	49,224	23.2	85,985	20.6
October 22	50,809	22.1	89,006	20.4
October 19	51,905	20.7	91,483	21.0
November 5	51,440	26.7	90,790	26.1
Cumulative total, 40 weeks	1,982,780	21.7	3,431,962	18.9

Rail freight traffic trends

Billion ton miles (Estimated)



1984 Outlook

Momentum at work

The traffic growth forecast for the new year will not be spectacular, but it will be stable. And as railroad prospects brighten, so will those of suppliers, though more slowly.

By GUS WELTY,
Senior Editor

Railroads are rolling into 1984 with what television sports analysts like to call "The Big Mo"—momentum.

Final figures on 1983 will show that railroad revenue freight ton-miles were up by at least 4%, on a carloadings increase of something like 1.5%.

Those increases may seem small. But they're not, considering that for almost all of first-half '83, ton-miles and loadings trailed 1982 totals. Not until June did the 1983 weekly totals climb above the graph-lines of '82. But, once the second-half surge began, it continued. And that surge is expected to continue into and through 1984.

The new year will have a couple of things going for it. One is that there is a natural force behind the now-growing economy, a force that seems likely to provide a sustainable growth pattern. A second is that 1984 is an election year, with the power sufficiently divided between the Executive and the Legislative branches that neither party can afford to do anything to send the economy into another tailspin.

● **Growth with stability.** Projections now are that there will be a continuation of the already-substantial gains in rail traffic through the early part of next year, with a possible tapering-off in the second half as the growth-rate percentages are figured against a bigger base. Richard E. Briggs, executive vice president of the Association of American Railroads, sees growth with stability, growth that may be more durable because of that stability.

Briggs has been right before, in forecasting and in interpreting trends, such as the one that saw TOFC/COFC traffic continuing to grow during the recent recession instead of dropping more precipitously than other traffic as had been the case in past economic downturns.

His and other analyses now are that trailer/container traffic, growing in '83 at a rate of about 20%, may not sustain that rate next year against the bigger base numbers. But a growth rate of 10% seems reasonable, if not actually conservative. Perhaps even more important, the outlook is that the profit margins on TOFC/COFC traffic may be going up, for sev-

eral reasons. First, rail costs should come down as piggyback traffic is concentrated at more efficient terminals. Second, service improvements made possible in good part because of terminal improvements may justify higher rates. And third, rate adjustments may also be possible with the expected reduction in over-capacity in the motor-carrier industry.

Grain traffic looks good for '84, continuing a trend that began during second-half '83 despite lower plantings and a crop-destroying drought. Much will depend upon the shape of the export market, but the trends seem positive.

Chemical traffic has been up. So have loadings of lumber and wood products. Here, too, the trends seem positive.

● **A green light for auto traffic.** Loadings of motor vehicles and equipment have also been showing increases not just from '82 but also from 1981 levels, and the indicators for '84 are almost all green. Car-buyers seem to like the '84 models, dealer inventories have been coming down and automakers have been going into overtime production, with fourth-quarter output expected to be 50% or more above output for the last three months of 1982. One reflection of this particular outlook: Railroads have resumed ordering autoracks, and more roads are expected to join those whose orders are already on the books.

Coal will continue to be a problem. Domestic demand may pick up somewhat early next year, although many stockpiles remain high. Exports will likely continue to be depressed, because other exporting nations are making cheap coal available, because oil prices have remained stable, and because the strength of the dollar is working against U.S. exports.

What railroads have going for them is that they have been able to increase market share in key markets. What railroads will need in '84 and beyond is the ability to keep on increasing their share in these markets, while also making gains in markets where total traffic is not increasing by much if at all.

The fact is that rail carloadings in some commodity areas have dropped so sharply since the late 1970s that the only hope may be to increase share-of-market, because traffic in the absolute may never come back to its old levels.

If you index carloadings against a 1978 base number, you find that loadings in metallic ores, metals and metal products, and aggregates are running about half what they were, based upon comparisons between third-quarter 1983 and the same three-month period in '78. Loadings in the areas of primary forest products and paper/pulp are, at best, about three-fourths of what they were.

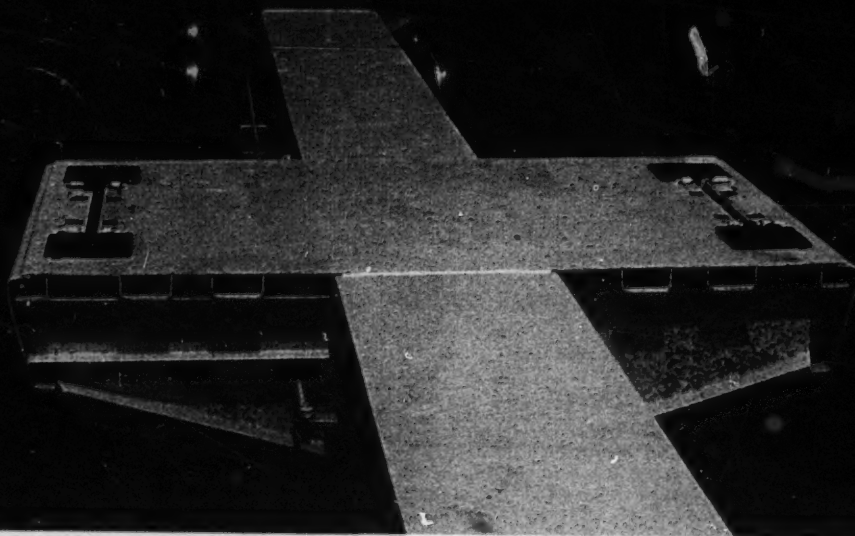
● **The emphasis must shift.** So-called smokestack industries will probably come back, somewhat. For whatever it's worth, for example, consumption of iron ore has been going up while deliveries of ore to mills have been down, and so declining inventories will eventually have to be replenished. But it is not likely that rail traffic in this basic commodity—or in certain others—will ever again match past records.

That's why it's so important that railroads concentrate on opportunity areas, and the biggest of all of these is intermodal. That's also why it's so important that railroads concentrate on productivity improvements to keep costs down—a concentration that will be tried and tested in '84 with a new round of contract bargaining coming up with the rail labor organizations.

Railroads have made much of what they have been able to do under deregulation. Outside observers have made much of what the industry has been able to do, contrasting it to the airline and motor-carrier industries, where deregulation has led to bankruptcies and something resembling chaos.

What seldom seems to be pointed out is that railroads and airlines and truck lines are different, and that the impact of deregulation has been different for several reasons, the most important of which may have to do with freedom of entry.

Deregulation has been similar for all three industries, in that it brought freedom to change prices quickly in order to react to market conditions. It also brought entry-freedom—but that has been a freedom that only an air carrier or a trucker could exercise effectively. To put it another way, an airline can go into business with a few leased planes, a few airport slots and a non-union workforce, while a trucker can begin operating with a leased tractor and a job or two—but it takes money to get into railroading unless you're



Santa Fe, a pioneer in new piggyback equipment, sees intermodal traffic as the producer of half of its freight revenues within the next few years.

going into a short line which a trunkline railroad no longer wants.

So, the business of railroading turned for the better in 1983 and it's going to be even

better in '84, according to all forecasts.

● **The equipment picture.** But what does this mean for the other part of railroading, the companies that supply railroads with equip-

ment and with materials? In all probability, it means another year of "maybe," another year of "sometime."

No group of suppliers has suffered quite so



Trainmen in St. Louis assemble UP/MP train SZB, which cuts delivery time between St. Louis and the West Coast by a full day.

Where the growth is

Year	Revenue piggyback cars loaded	Index
1957	249,065	100
1960	554,115	220
1965	1,076,280	432
1970	1,449,519	582
1975	1,307,520	525
1978	1,840,588	739
1979	1,857,705	746
1980	1,686,121	677
1981	1,752,479	704
1982	1,920,377	771
1983*	2,304,450	925

*Estimated

much during the past two years as the car-builders. The locomotive builders, General Motors' Electro-Motive Division and General Electric, haven't prospered, but at least they have kept their doors open and some of their people employed, and their prospects are looking better for '84. Track-machine and track-products suppliers have also been able to hang in, because railroad capital and maintenance budgets for roadway-and-structures have held up fairly well. Signal-and-communications suppliers have hung on, with some railroad business but with rail transit projects really keeping them going.

For the locomotive builders, '84 should be better. The locomotives themselves will be better, with both major builders coming into the microprocessor era and with both promising (and delivering) improved fuel efficiency and improved reliability. Manufacturers of track machines and other track-related products should also gain; track was where most of the dollars went in 1983, and track is probably where most of the money will go in '84. Manufacturers in the signal-and-communications area may find '84 another year in which transit will be the bigger market—but the indications are that it's only a matter of time before the products they're coming out with, new ones and improved ones, will add up to offers that railroads can't refuse.

As for the freight-car manufacturers, '83 was the year when fall-out finally began, a fall-out that had been expected in view of low order-levels, over-capacity and surpluses of cars that were expected to continue.

This year, freight-car deliveries will reach about 5,000. That's going to be the lowest total since the years of the Great Depression; even 1935 saw deliveries of almost 6,000 cars.

In this year of freight-car drought, Pullman Standard tucked it in, selling its design portfolio and its carbuilding plants to Trinity Industries; Whittaker decided to dispose of Berwick, and General American had just about made up its mind to stop manufacturing cars.

Carbuilders are looking for better things in 1984, keeping in mind that all things are relative. The estimates, as the American Railway Car Institute had collected them for a Dec. 1 forecasting meeting: For '84, on an arithmetical averaging basis, new-car orders may add up to about 19,000, with deliveries rising from the 1983 low to about 13,000 cars. As usual, the ranges in the ARCI estimates were wide-ranging. The low on new orders was about 5,000, the high was 33,000. The low on delivery estimates was 4,000 cars, the high was 26,000.

As for distribution of orders and deliveries by car-type, that remained a mystery. As of late-1983, there were a couple of utilities inquiring for coal cars, one railroad looking at between 250 and 350 covered hopper cars for cement traffic and Trailer Train looking at 500 intermodal platforms as a first order out of 2,000 platforms proposed for the new year.

Beyond that, it could be expected that tank cars would continue to be relatively strong in demand in '84 as they were in '83. It could also be expected that at some point grain covered hopper cars might be ordered again.

Builders, both locomotive and freight-car, were looking at the surplus numbers, as railroads also had to be, as 1983 came to its end.

• **The surplus fleet shrinks.** On the freight-car side, the stored-surplus fleet averaged 241,000 in 1982 and peaked at 300,000 early this year. By October, that unused fleet had gone down to approximately 167,000 cars, about what the average was in 1981. Interestingly, about 56,000 of the stored cars were boxcars that might or might not have a future, but only 14,000 were covered hopper cars.

Locomotive-storage figures told much the same story. After reaching a peak of well over 6,000 units sitting around, the idle fleet as of a few weeks ago was at approximately 3,500 units.

It stood to reason that much of this stored equipment would not again turn a wheel in revenue service. Many of the cars were old,

inefficient, not suited to current traffic patterns, and in need of repair. The same might be said about a good number of the unused locomotives, even after some had been used as trade-ins or simply scrapped.

The figures translated somewhat more positively for the locomotive builders than for the carbuilders. GE, with a China order for 220 C36-7s, was forecasting a 25% increase in output in '84. EMD was looking at an '84 that would at least match '83 production—and, importantly, the vibes at LaGrange for 1985 were all positive, reflecting a confidence that continuing heavy expenditures for R&D and for improvements in manufacturing processes would pay off in the absolute and in market share.

Freight-car manufacturers were looking at the new year more cautiously. Even those with what, by current standards, could be regarded as a decent backlog were hedging as to when things might really begin to look brighter in the marketplace. As one builder put it, "I keep seeing a light at the end of the tunnel—but the tunnel keeps getting longer."

Still, cars are being built. Thrall, with Trailer Train articulated intermodal cars on order and with the American President Lines order for double-stack container well cars, will be keeping two lines in operation. Ortner continues as a force in the market for coal cars. FMC's Marine and Rail Equipment Division recently had the sample-car inspection on its latest order for the Irel Impack intermodal car, this order for Trailer Train. Portec will soon be starting construction of 100 Algola cars, and it's looking forward to building long log cars for a major paper company. ACF's Amcar Division has had the Burlington Northern order for intermodal cars. Both Portec and Thrall have orders for auto-racks. Evans Products is looking for an acceleration of tank-car programs, probably in second-half '84, while it (along with several other builders) continues to work on an intermodal prototype.

Diversification is helping some major sup-

In a buyer's market, equipment suppliers are finding that technological capability alone is not enough; they also need financing expertise.

pliers, those with significant leased-car fleets and especially those with products that go beyond the freight car. Portec, for example, is forecasting a good year for both its RMC Division and its Railway Products Division. Evans, meanwhile, sees a modest pickup for its Railway Track-Work unit, and its Monon trailer unit has been setting records by just about any measurement.

Still, more shakeout is expected in the supply industry, more than what has already occurred, because over-capacity continues to exist in most areas—and survival will go to those who are the most efficient, the most capable of adapting to the demands of a market that will likely not be buying anything in mega-quantities.

● **A slow start on '84 budgets.** What will railroads be going for in 1984 capital budgets? Hard numbers are hard to come by. A couple of roads are muffled because they are in registration with the Securities and Exchange Commission. Others are reluctant to say too much because directors have not approved '84 improvement plans.

But, from those roads that can talk about budgets, the signs are somewhat encouraging.

First, there was virtual unanimity among chief executive officers on a recently Railway Progress Institute panel that expenditures next year will at least match those for this year, with emphasis on fixed plant, and the panelists were the top people from Burlington Northern (which has had the industry's biggest programs for a couple of years), Southern Pacific, Norfolk Southern and Grand Trunk.

Second, there are these numbers which can be talked about subject to approvals and possible modifications. For the CSX roads, Chessie and Seaboard, proposals call for expenditures of \$251 million for fixed plant and \$95.6 million for equipment in 1984. This year, the totals will run \$118.8 for plant and \$73.4 million for equipment. Conrail, meanwhile, is forecasting an '84 program of \$215 million for roadway and track, plus an expenditure of \$130 million for other plant additions and improvements (including more than \$35 million for communication and signal improvements, up from about \$20 million this year). Roadway and track improvements will be in the range of what they were this year, close to 500 miles of rail, 1.3 million cross-ties, about 575 turnouts, and surfacing of approximately 5,800 miles. In '83, Conrail acquired 120 new locomotives, in '84 it will be getting 100; in '83, Conrail acquired no new freight cars but in '84 it will be getting 100, the locomotives valued at \$101 million, the cars at \$7 million.

Amtrak had a \$100-million capital program

this year, and the total will be about the same in FY 1984. On the equipment side, Amtrak has ordered three prototype carbody shells from Budd at a cost of \$2.75 million, and it is evaluating the need for additional baggage cars; 1984 work will also include additional headend power conversions including full-length dome lounge cars for Auto Train and further rehabilitation of auto carriers needed for daily Auto Train operation.

● **The longer range.** What future markets will be remains to be seen. For example, a number of roads have made heavy expenditures in the past few years for track machines. The question, put to one builder, is: With this heavy spending, has the machine fleet been improved and renewed to the point that even this market will go into a decline? His answer: No, because there is still a lot of old and inefficient equipment being operated, and because even with good maintenance and repair practices these machines get hard use and their life may average just seven years.

As for locomotives, the optimism of both EMD and GE would seem to be justified. Forget for the moment the R&D on new forms of motive power, even though it's likely to bear fruit, some day. Remember the accomplishments that the builders have made and are continuing to make with the diesel-electric. Remember also what generations of managers at LaGrange have been saying, which is that "We're locomotive builders—whatever kinds of locomotives prove out best for different kinds of service." They're still saying that at EMD, as at GE, where research into coal-fired motive power has been made more public than perhaps elsewhere.

Then, there are the suppliers in the communications and signal field. Rail transit has been the market that has kept them going. Among the majors, neither Union Switch & Signal nor General Railway Signal sees any great hope for railroad growth in '84, even though a road or two or three will have major programs going. But, the thinking is, transit projects are going to continue, high-speed passenger lines may offer something—and the Class I railroad market will come back.

What all this adds up to, or subtracts from, are these numbers: Railroad capital spending last year totaled less than \$2 billion, down from its high of \$3.6 billion in 1980. Railroad capital spending this year will probably total no more than \$1.8 billion. Railroad capital spending next year should be up, but not enough to approach any records.

● **Financing can make the difference.** In the past, some suppliers are saying, it was a simple case of "if you don't need it, don't buy it." Now, some say, it's a simple case of "even if you don't need it right now, buy it if the

price is right." But the phrase "buy it" could be replaced by some other phrase because of some of the creative financing that has been going on.

Railroads, probably, are reasonably safe. There is enough capacity in almost all areas of the supply industry that some attrition can take place without foreseeable railroad needs going unfulfilled, or with those needs even getting a long lead-time. Survivors, among suppliers, will be the strong ones, those that prove able to ride out the ebb tide and ride the rip. Survivors will be those that maintain the R&D projects, develop production flexibility, and diversify, while promoting their capabilities by whatever means available.

Railroads, in the meantime, may at some point have to deal with suppliers who have memories—which is to say that hard dealers now may find themselves dealt last when the seller's market develops.

Buying, during the last couple of years, has had something to do with product quality. But buying has had more to do, some observers would say, with dollars—price and financing arrangements. One major equipment supplier, for instance, did all the economic studies involved with a major purchase, proved that the acquisition would be positive—and then didn't even get half of the resulting order, because a competitor came in with a better financing package. That supplier now has the financing expertise to match its technological expertise.

In the meantime, at least some suppliers of components have been announcing price increases, after having been driven down on price for many months. The theory might be that "if we don't have any business, we might as well not have it at a higher price." Nevertheless, it's a refreshing change from the old theory—made popular by several bankrupt railroads—that it's fine if you lose a little on each sale so long as you make it up on volume.

But what then about 1984? Neither railroads nor suppliers—nor railroad customers—can now say for sure. The only thing that any of them can say is that '84 will be a year of change—with, perhaps, more change than any year since deregulation became a fact. And the biggest change that may come? This new year could be the year in which the true transportation company comes into being, CSX leading the way toward formation of such a company, with its railroads, its motor-carrier operations, and its barge-line acquisition proposal. The total transportation company almost has to come into being sometime, not because competing forms of transportation want it to but because the people who buy transportation will demand it, for the sake of simplicity, economy, and efficiency. ■

NOTE

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66-67.

January 1984

**High-speed corridors:
A realistic appraisal**

RAILWAY AGE

...for the new age of railways

1/19/84
- 8490 -

Change!

It will be nothing less than an American transportation revolution—and its time is fast approaching.

It will bring significant public benefits through the restructuring of a now-fragmented transportation industry. It will bring significant benefits to transportation agencies through productivity improvements made possible by that restructuring.

The whole world of transportation will be changing. And railroads will be the key to that change.

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RAILWAY AGE

...for the new age of railways

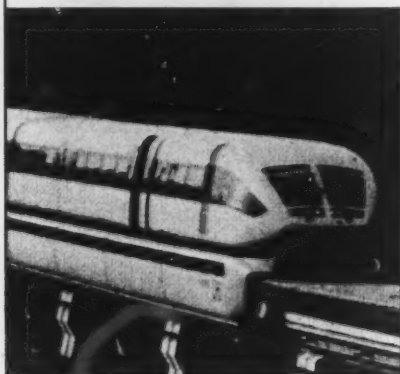
RAILWAY AGE

Iron and steel are the backbone of American transportation. They are the backbone of the nation's railroads.

It will be a long time before the nation's railroads are the backbone of the nation's transportation industry. It will be a long time before the nation's railroads are the backbone of the nation's transportation industry.

The whole world of transportation will be changing. And railroads will be the backbone of that change.

Cover: Design by Art Director Maurice H. Mates.
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Features

37 Change!

Railroads are in the forefront of the revolution that is sweeping American transportation. In the first of a year-long series of articles, Senior Editor Gus Welty examines the promises—and the pitfalls—of change as it could affect the carriers, their customers, and their suppliers.

46 The great train race

A dozen and a half high-speed corridors are starting to crystallize, and manufacturers around the world are eyeing a multi-billion-dollar market.

56 High-speed tilting trains?

The concept has been around for 40 years, but complete success has eluded mechanical engineers. Sweden now thinks it's on the right track.

59 Transit: More in '84

1983 was a year of expansion for passenger railroading; 1984 will see more of the same with \$3 billion tagged for transit capital outlays alone.

61 Passenger-car market at a glance

An exclusive *Railway Age* report on the number of new passenger cars delivered in 1983, the undelivered backlog, and the outlook for future orders.

63 Clinton shops come to life

As traffic picks up, railroad shops are getting busier. C&NW plans to put three times as many cars through Clinton this year as it did in '83.

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- 25 UP plans big track program
- 25 Santa Fe budgets \$401 million
- 26 Chessie sees rise in export coal
- 26 For BN, a 12th coal contract
- 26 Shipping starch, the rail way
- 26 Santa Fe pursues Star Lake proposal
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Inside

Change!

On a muggy Saturday afternoon last August, the two principal editors of this magazine sat down on a back porch in Hinsdale, Ill., to start planning an editorial program for 1984. This time around it was easy. It was quickly agreed that the railroad story of the year—or even the century—could be summed up in one word: **CHANGE**. Out of that and subsequent planning sessions came the idea for a series of 12 related articles of which the first—an introductory essay by Senior Editor Gus Welty—appears in this issue (p. 37). Other articles in this year-long series will explore the impact of change on specific railroad systems (CSX will be first, in February) and, in alternate issues, its impact on broad general areas of railroading (we'll tackle the right-of-way in March).

The reasoning behind this series is summed up in the editorial calendar that has now been circulated to our staff: "Change is sweeping the railroad industry—change of a magnitude not seen since the expansionist days of the 19th century. This late 20th century revolution has come so quickly that it is not fully understood by the railroads' customers, by their investors, by their suppliers—indeed, by many railroaders themselves."

It is our hope that, by synthesizing the best thinking that is now going on, inside and outside the industry, we can contribute to a better understanding of what is happening—and what might lie ahead.

In addition to the **CHANGE** series, each issue of *Railway Age* in 1984 will carry half a dozen other main features covering every aspect of freight railroading as well as rail transit—all part of carrying out our pledge to be the railroad publication that covers all of the industry, all of the time.



LUTHER S. MILLER

High-speed trains: When—and where?

The high speed revolution has been slow to reach our shores. During the years when we have been spending billions to upgrade the Northeast Corridor to 120-mph speeds—a still unfinished task—the French have built a 167-mph TGV system that is now in its third year of operation and is already expanding. But our time may at last be approaching. A dozen and a half corridors are now being explored for their high-speed-train potential, with the enthusiastic encouragement of the purveyors of half a dozen fast, very fast, or ultra-fast technologies. Associate Editor Frank Malone's appraisal of what is going on, and what may happen in the near or distant future, starts on p. 46.

Market Outlook

Facilities

Amtrak: Fixed-plant expenditures for FY 1984 will include \$28 million for Northeast Corridor (non-NECIP) right-of-way programs; \$6 million for maintenance-facility reconstruction at Los Angeles; \$4 million for redevelopment of Penn Station and \$3 million for reconstruction of Sunnyside Yard, New York. Los Angeles and New York expenditures represent Phase I work on the respective projects.

CP Rail: Is constructing an intermodal terminal in Strathcona Industrial Park, Edmonton, at a cost of \$14 million. The facility is scheduled to open in October 1984.

CN Rail/CP Rail: A projected 10-year, \$16-billion capital improvement program (RA, Dec., 1983, p. 11) includes an estimated \$750 million for signal and communications projects.

Massachusetts Bay Transportation

Authority: General Railway Signal is the apparent low bidder, at \$21.9 million, for signaling MBTA's Orange Line in Boston. For this Southwest Corridor project, GRS will supply and oversee the installation and testing of transit signals, communications and cab signals. The project is to be completed by December 1986.

New York DOT: Has designated a research team headed by Peat, Marwick, Mitchell and Co. and including Transportation and Distribution Associates and Gellman Research Associates to carry out a \$200,000 study to evaluate market demand for a proposed "very-high-speed" rail passenger line linking New York City, Albany, and Montreal.

Union Pacific System: Will build an automobile distribution center on a 40-acre site adjacent to the Missouri Pacific main line near Reisor, La., to serve the Shreveport area. The terminal, which will have five unloading tracks, is scheduled for completion in February.

Freight cars and locomotives

	DELIVERED			Eleven Months		
	November		October	1983	1982	
	1983	1982	1983	1983	1982	
Built new by carbuilders	615	525	736	4,825	15,061	
Built new in RR shops	0	85	0	202	1,433	
Built new—total	615	610	736	5,027	16,494	
Rebuilt	0	140	0	100	1,326	
TOTAL DELIVERED	615	750	736	5,127	17,820	
Locomotives (new and rebuilt)	11	39	43	209	427	
ORDERED						
To be built new by carbuilders	351	249	642	5,157	6,090	
To be built new in RR shops	0	0	0	2	750	
To be built new—total	351	249	642	5,159	6,840	
To be rebuilt	0	0	0	100	600	
TOTAL ORDERED	351	249	642	5,259	7,440	
ON ORDER AND UNDELIVERED						
	December 1		November 1		Average Backlog	
	1983	1982	1983	1983	1982	1982
To be built new by carbuilders	3,156	4,378	3,368	3,969	8,194	8,194
To be built new in RR shops	0	488	0	25	824	824
To be built new—total	3,156	4,866	3,368	3,994	9,018	9,018
To be rebuilt	0	174	0	25	342	342
TOTAL ON ORDER	3,156	5,040	3,368	4,019	9,360	9,360
Locomotives (new and rebuilt)	128	69	128	122	147	147

Source: Transportation Division, AAR

Source: Transportation Division, AAR.

Equipment

Burlington Northern: Acquired 500 Strick trailers, valued at \$7.5 million, under a lease arrangement with PLM Transportation Equipment Corp.

Caltrans: Sumitomo, which is supplying up to 63 push-pull commuter cars for Caltrans' Peninsula Commute Rail Service, awarded a contract to General Electric to assemble them in San Francisco.

CN Rail: The Transcona Shops in Winnipeg, which built 432 100-ton-capacity gondola coal cars in 1983, will build an additional 216 cars in 1984 to complete the \$37-million contract.

CN Rail and CP Rail: Have been seeking tenders from Bombardier and from General Motors of Canada for the supply of a total of 70 new main-line diesel-electric units—40 for CN, 30 for CP. Meanwhile, CP Rail has ordered 150 100-ton ballast

cars worth \$9.1 million (Canadian) from National Steel Car for use in the 1984 track program, which CP says will be about double that of 1982.

Chesapeake & Ohio: Awarded an issue of \$21,345,000 of equipment trust certificates to a syndicate headed by Merrill Lynch White Weld Capital Markets Group. The offer represented a net interest cost to the company of 11.95%. The trust will finance 100% of the estimated cost of 23 3,500-hp SD-50 Electro-Motive diesel-electric units.

Chessie System: Plans to acquire 171 fully-enclosed auto rack cars (70 bi-level and 101 tri-level) at a cost of more than \$5.3 million.

New York Metropolitan Transportation Authority: Ordered 19 push-pull commuter cars, valued at \$20 million (Canadian), from Bombardier for service on Metro North's Upper Hudson line.

Market Indicators

ARCI 1984 market forecast summary

The 27 carbuilders, component suppliers and others who participated in the American Railway Car Institute's 1984 market forecast expect both orders and deliveries of new cars to be substantially above the rock-bottom levels of 1983; but it will still be a year of low activity as railroads continue to work off their car surpluses.

The "median" forecast for 1984 calls for 20,000 cars ordered and 12,900 delivered. The 1985 forecast calls for orders rising to 33,000 cars, with 25,000 cars delivered.

FREIGHT CARS

		Average	Median	Range	
				Low	High
1984 Orders -	All respondents	19,029	21,000	4,981	33,000
	Carbuilders	17,754	16,000	9,800	30,000
	Others	20,213	20,000	4,981	33,000
1984 Deliveries -	All respondents	13,341	12,900	4,347	26,000
	Carbuilders	13,735	12,500	8,600	26,000
	Others	12,975	12,950	4,347	23,000

Respondents - 13 Carbuilders
14 Components and Others

Source: American Railway Car Institute

Revenue freight carloadings

Commodity	Dec. 10 week	% change from 1982	Dec. 3 week	% change from 1982	Nov. 26 week	% change from 1982	Nov. 19 week	% change from 1982
Grain	31,275	48.9	25,852	7.5	23,420	21.8	31,252	13.8
Other farm products	4,106	(30.6)	4,213	(31.5)	3,471	(36.2)	3,971	(33.2)
Metallic ores	14,286	2.8	15,343	41.5	13,040	22.3	16,583	48.5
Coal	111,340	7.0	104,743	8.8	83,966	7.1	113,888	6.5
Crushed stone, gravel and sand	10,192	26.5	10,583	23.5	7,428	21.8	10,973	16.0
Nonmetallic minerals	11,620	12.2	12,442	22.0	8,309	13.3	11,194	12.0
Grain mill products	11,520	(4.9)	10,447	(11.8)	8,555	(10.0)	10,519	(11.0)
Food and kindred products	11,666	(10.0)	11,504	(11.3)	8,761	(15.2)	11,450	(15.8)
Primary forest products	14,595	1.0	15,187	6.0	10,550	0.1	15,139	0.9
Lumber and wood products (except furniture)	6,963	14.0	6,901	11.5	5,169	5.6	7,168	9.7
Pulp, paper and allied products	15,313	(1.7)	16,058	(2.3)	13,593	(4.7)	14,829	(4.2)
Chemicals and allied products	23,412	16.7	25,398	17.6	20,015	19.6	23,959	18.7
Petroleum products	4,891	7.4	4,875	7.0	3,597	(1.7)	4,865	(2.0)
Stone, clay and glass products	10,406	19.5	10,818	15.2	8,535	8.5	10,482	10.8
Coke	5,639	52.6	6,427	66.7	4,486	35.0	5,419	63.9
Metals and products	8,968	42.6	9,564	33.0	7,530	48.3	8,902	27.7
Motor vehicles and equipment	20,794	42.5	19,808	50.1	14,129	47.5	20,168	55.4
Waste and scrap materials	9,493	38.6	8,753	33.8	6,630	30.0	9,621	26.7
Forwarder and shipper assn. traffic	9,928	34.0	9,379	33.5	7,156	25.3	9,825	28.0
All other carloads	54,956	18.9	52,308	20.0	42,059	19.4	55,235	22.1
LCL traffic	244	(76.3)	236	(76.4)	185	(73.6)	270	(74.6)
Total Cars Loaded	391,607	14.0	380,839	13.4	300,584	11.5	395,712	12.1

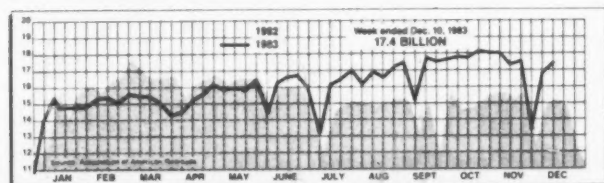
Estimated revenue ton-miles (billions)	1983	1982	% change from 1982
49 weeks	783.8	758.8	3.3

Piggyback loadings

Week ended	Cars loaded 1983	% increase from 1982	Trailers/containers 1983	% increase from 1982
November 12	48,596	23.6	85,915	24.6
November 19	49,684	23.8	89,484	26.8
November 26	37,081	20.3	64,736	21.3
December 3	47,197	20.1	87,032	27.0
Cumulative total, 48 weeks	2,164,812	21.7	3,759,167	19.4

Rail freight traffic trends

Billion ton miles (Estimated)



######

REVENUES AND EXPENSES OF RAILWAYS

Third quarter figures of calendar year 1983

(Dollar figures are stated in thousands, i.e., with last three digits omitted)

Operating revenues

Ways & structures

Equipment

1983

Income after fixed charges

Net Ry. operating income

Net income

1983

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1981

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Kansas City Southern	3 mos.	77,016	3,453	80,469	72,504	13,471	15,355	755	16,046	5,325	70,017	66,838	87,01	92,18	9,045	3,098	6,554	8,507	2,840
Missouri-Kansas-Texas	9 mos.	222,367	9,728	232,095	237,000	41,366	47,621	2,350	54,769	15,620	205,777	208,366	86,06	87,53	21,879	20,476	10,830	17,899	15,469
Missouri Pacific	3 mos.	51,923	2,763	54,686	57,799	9,918	10,993	411	13,348	14,659	51,146	54,543	93,52	94,36	932	1,017	3,269	932	1,017
Norfolk & Western	3 mos.	160,819	7,551	168,370	178,926	27,106	29,189	1,233	40,718	47,796	154,091	166,794	91,51	93,21	7,075	4,456	13,707	7,275	4,456
Pittsburgh & Lake Erie	3 mos.	404,423	10,366	414,789	400,457	74,074	74,507	2,763	96,408	94,474	372,857	374,574	88,80	91,40	28,729	27,246	36,929	22,185	20,060
St. Louis Southwestern	9 mos.	1,207,348	29,942	1,237,290	1,300,617	216,381	200,585	8,266	282,810	304,736	1,123,821	1,149,582	90,83	88,38	73,459	130,468	97,700	50,344	95,329
Seaboard System	3 mos.	359,949	15,358	385,307	380,164	88,893	116,775	3,993	66,065	55,288	331,774	384,344	86,10	95,83	81,692	61,744	96,987	58,336	37,528
Soo Line	3 mos.	1,076,240	42,871	1,119,111	1,354,797	254,736	268,203	11,726	206,976	230,019	1,000,125	1,085,812	89,36	80,14	188,650	360,772	76,980	124,057	220,479
Southern	3 mos.	8,639	456	10,095	9,744	1,326	1,516	49	4,740	4,938	420	13,757	15,334	157,26	(5,505)	(8,483)	(1,538)	(3,500)	(5,188)
Southern Pacific	3 mos.	28,843	1,179	30,022	37,488	4,797	7,400	142	14,208	10,863	1,072	43,439	47,751	144,69	(20,549)	(14,738)	(4,186)	(18,544)	(13,150)
Union Pacific	3 mos.	267,231	14,339	271,449	264,850	38,996	39,530	2,069	67,658	58,593	13,214	251,252	232,021	92,55	87,60	25,399	36,640	12,173	26,595
Western Pacific	3 mos.	598,825	12,499	609,325	566,754	107,903	106,354	5,022	155,301	144,671	19,716	577,237	554,099	94,73	97,98	20,113	6,249	34,236	19,481
	9 mos.	1,780,157	38,985	1,819,122	1,826,462	313,467	333,231	15,254	470,038	458,730	58,841	1,722,250	1,763,069	94,67	96,52	72,037	57,804	100,220	67,276
	3 mos.	79,827	1,873	81,700	69,304	20,923	18,498	484	16,379	14,339	2,038	74,523	66,783	91,21	96,36	7,518	3,552	4,540	2,807
	9 mos.	210,026	4,839	214,865	216,514	46,891	46,624	1,443	48,421	46,505	6,088	204,370	200,187	92,45	11,161	19,904	7,008	7,056	12,881
	3 mos.	398,453	9,022	407,475	387,040	75,090	64,865	5,273	79,055	83,065	19,790	354,616	346,783	87,02	99,59	48,153	38,768	28,429	28,367
	9 mos.	1,173,757	25,833	1,199,590	1,219,568	195,895	189,725	15,824	241,833	247,672	59,487	1,025,813	1,047,345	85,40	85,87	164,411	174,411	116,263	98,750
	3 mos.	488,637	14,029	502,666	472,970	100,535	69,870	4,913	143,629	132,208	21,299	546,176	487,824	108,65	103,14	(31,981)	(5,125)	14,001	25,530
	9 mos.	1,421,634	40,598	1,462,232	1,551,065	269,008	247,709	14,642	411,778	449,598	64,061	1,556,673	1,606,923	106,45	103,59	(75,532)	(11,482)	(36,931)	(18,022)
	3 mos.	458,594	6,667	463,261	430,374	62,814	66,798	3,470	92,532	88,253	23,879	390,297	377,593	84,24	87,73	66,383	44,318	47,844	41,215
	9 mos.	1,311,319	19,236	1,330,555	1,381,003	202,360	206,469	10,404	273,966	282,227	71,782	1,190,063	1,218,354	86,44	89,51	132,710	124,969	91,113	83,215
	3 mos.	37,015	428	37,443	43,246	5,407	6,977	151	10,425	9,976	1,765	42,589	44,376	113,74	102,61	(7,609)	(1,882)	(2,134)	(887)
	9 mos.	113,959	1,284	115,253	134,145	18,563	21,767	445	30,763	30,937	5,300	132,441	136,124	103,71	(14,828)	(2,199)	(6,336)	(6,065)	(594)

*B&O figures include second and third quarter revenues and expenses of Western Maryland Railway Co. to reflect combined operations since May 1, 1983.

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February 1984

New Jersey Transit:
Transition without trauma

RAILWAY AGE

...for the new age of railways

Change in the '80s

CSX sets a fast pace



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BETHESDA MD 20814
DIR

Loading the Orange Blossom Special
at Taft Yard, Orlando

RAILWAY AGE

...for the new age of railways



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Features

36 Change! CSX sets a fast pace

The outlook for rail-truck-barge coordination, and the impact of other changes that are revolutionizing railroading, are explored in an exclusive interview with CSX Chairman Hays T. Watkins and President A. Paul Funkhouser.

44 The rocky road to good track

Keeping ballast clean and in its place is a never-ending and troublesome task that continues to test the ingenuity of trackmen and track-machine builders.

50 BN: Big bucks for C&S

Installation of 1,400 miles of ctc, including 200 miles this year, has been the main component of a capital improvement program that has cost nearly \$200 million.

52 Tumbler Ridge turns on

British Columbia's new 80-mile electrified line will reap rich rewards for BCR as it begins the movement of 9 million tons of coal a year to Japan.

55 New coatings: Better, safer

Spurred by EPA's low-pollution rules, suppliers and users are working together to develop coatings that will do the job better—and perhaps cheaper—than ever.

58 New Jersey Transit: Transition without trauma

Creation last year of the nation's third busiest commuter railroad—NJ Transit Rail Operations—was accomplished with remarkable smoothness.

60 Bethlehem promises "world-class" rail

An \$85-million continuous bloom caster that has gone into operation at Steelton will be used mainly in the production of rail steel.

61 Freight railroading in '83: A statistical review

The latest tables and graphs from the Association of American railroads provide a useful, at-a-glance summary of railroad performance in 1983.

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Inside

Marketers and innovators

"Staggers was the most important piece of railroad legislation in 100 years," CSX Chairman Hays T. Watkins observed in a recent conversation with the publisher and the editor of this magazine. "It not only allowed—it actually forced—the railroads to become modern corporations and to learn the meaning of a few new words—words like marketing and innovation."



LUTHER S. MILLER

How well and how fast CSX has learned the meaning of these words came out clearly during an interview that *Railway Age* conducted with CSX Chairman Watkins and President A. Paul Funkhouser, and in subsequent exchanges with the presidents of CSX's two rail systems, Seaboard and Chessie.

We asked about CSX's total-transportation concept: How exactly will barges and trucks fit into the picture?

We asked about car-ownership trends, coal-burning locomotives, computers, fiber optics, sales strategy, and more.

We got good answers to the questions we asked; we even got answers to questions we didn't ask and in the process learned about CSX's pioneering efforts to put its sales people on a commission basis; about a human resources data bank now in the making.

Our report on CSX's marketers and innovators begins on p. 36—second of a series of articles exploring the effects of late-20th-century change on the railroad industry.

Coming in March: Change on the right-of-way.

Fiddling around with ballast

"In any system doing its job well amid the uncertainties and imperfections of this universe, there has to be something you can fiddle with to keep the whole thing in tune..."

Thus begins Associate Editor John Armstrong's piece in this issue on the very foundation of railroading: rock ballast. If you think you know all you need to know about this subject, you are probably wrong.

Why has ballast consumption increased 75% at a time when total track mileage has been shrinking?

Why are more and more ballast cars custom-made for the job?

What is British Rail's "stone blower"—and what can it do that existing machines can't do?

Why did French National Railways, in building the TGV high-speed line, opt for ballasted track over slab track?

For answers, see the story that starts on p. 44.

Market Outlook

Equipment

CP Rail: Ordered 30 3,000-hp diesel-electric locomotives from General Motors of Canada at an estimated cost of \$45 million (Canadian). Delivery is to take place during September, October and November of this year.

Trailer Train: Ordered 500 single-platform, single-axle intermodal cars, 250 from Thrall Car and 250 from United-American. Most of the cars will be equipped with UIC trucks, but some will have National Castings and some will have British Rail designs; weight of the cars will be approximately 25,500 pounds per platform. Sample cars are expected out in late March or early April, and Trailer Train expects to have all 500 units delivered in the April-May period. Meanwhile, Trailer Train's next acquisitions are expected to be five-platform articulated cars, to be followed by orders for 1,000 or more additional single-platform single-axle cars.

Facilities

Chessie System: Is investing \$5.8 million in modernization of three sections of its Huntington, W. Va., Locomotive Shops—those involving electrical rotating equipment and components: wheel, axle and gear assembly; and truck assembly. The project, which is to be completed by mid-1985, involves installation of new cleaning, material handling and processing equipment along with computer-controlled gauging machinery, armature turning, undercutting balancing machinery and dynamic high-voltage current testing equipment.

Maryland Department of Transportation: Awarded a \$2.3 million contract to L.B. Foster Co. for the supply of 12.3 miles of contact rail for the Baltimore Transit System. The 85-pound steel and aluminum composite rail, which supplies power to transit vehicles, will be fabricated by Foster's Transit Products Division and delivered in the second half of 1984.

Freight car orders and deliveries*

DELIVERED					
	December		November	Twelve Months	
	1983	1982	1983	1983	1982
Built new by carbuilders	745**	477	615	5,570	15,515
Built new in RR shops	0	288	0	2	1,721
Built new—total	745	765	615	5,772	17,236
Rebuilt	0	174	0	100	1,500
TOTAL DELIVERED	745	939	615	5,872	18,736
ORDERED					
To be built new by carbuilders	805	231	351	5,962	6,321
To be built new in RR shops	0	0	0	2	750
To be built new—total	805	231	351	5,964	7,071
To be rebuilt	0	0	0	100	600
TOTAL ORDERED	805	231	351	6,064	7,671
ON ORDER AND UNDELIVERED					
	January 1		December 1	Average Backlog	
	1984	1983	1983	1983	1982
To be built new by carbuilders	2,905	4,095	3,156	3,880	7,852
To be built new in RR shops	0	200	0	23	772
To be built new—total	2,905	4,295	3,156	3,903	8,624
To be rebuilt	0	0	0	23	314
TOTAL ON ORDER	2,905	4,295	3,156	3,926	8,938

*Locomotive figures unavailable at press time.

**Includes 57 estimated.

Source: American Railway Car Institute

Estimated ownership—all revenue freight cars

December 1, 1983 vs. December 1, 1982

	Box	Covered Hoppers	Gondola	Hopper	Flat	Refg	All Others	TOTAL
Class I RPs								
1983	273,258	164,281	129,715	284,096	83,914	53,699	22,067	1,011,030
1982	232,214	167,604	135,483	293,972	86,502	57,984	23,194	1,046,953
Class II & S&T Cos								
1983	49,154	9,922	10,194	11,149	5,019	3,343	3,037	91,818
1982	51,105	9,525	10,444	12,257	4,778	3,404	3,342	94,855
Railbox-Railgon								
1983	15,089		3,998					19,087
1982	24,922		3,999					28,921
RRO&C**								
1983						5,203		5,203
1982						4,231		4,231
Private								
1983	521	129,579	27,945	21,543	53,547	2,022	185,486	420,643
1982	495	129,732	27,908	21,240	53,794	3,086	188,702	424,957
GRAND TOTAL								
1983	338,022	303,782	171,852	316,788	142,480	64,267	210,590	1,547,781
1982	358,736	306,861	177,834	327,469	145,074	68,705	215,238	1,599,917

*Class II railroads and switching terminal companies.

**Railroad owned and controlled refrigerator car lines.

Source: Transportation Division, AAR.

Market Indicators

DRI Railroad Industry Monitor

Data Resources, Inc., expects economic growth to continue in 1984, but the period of explosive growth that marked the 1983 recovery will give way to economic expansion at a more moderate rate. Auto sales and steel will show strength; retail auto sales are forecast to top 10 million units, and raw steel production is expected to exceed 100 million tons. Housing and agriculture will face some problems this year: DRI expects housing starts to peak by mid-year and then decline as deficit pressures push interest rates upward. The strong dollar will continue to hamper grain exports.

Total Class I rail traffic will increase by almost 75 million tons over 1983 levels as coal and ore traffic rise sharply, says DRI. Growth in intermodal traffic is predicted to

	1983:2	1983:3	1983:4	1984:1	1984:2	1984:3	1984:4
Economic Indicators (Annualized rates)							
Real GNP (% change)	9.7	7.6	4.9	5.0	4.2	4.2	3.9
Industrial Production (1967 = 1.0)	1.44	1.52	1.57	1.60	1.62	1.64	1.65
Housing Starts (mil. units)	1.68	1.79	1.73	1.76	1.80	1.82	1.73
Retail car sales (mil. units)	9.2	9.3	9.6	9.8	10.1	10.4	10.5
Raw steel production (mil. tons)	21.7	21.1	22.9	26.3	28.1	25.6	25.8
Total Class I Rail Traffic (millions of tons)							
Key Commodities	312.8	329.9	323.0	320.3	339.6	337.5	337.1
Grain	26.7	36.8	35.1	34.8	32.1	27.5	29.9
Coal	118.0	124.0	125.4	122.1	129.8	130.7	138.2
Pulp & paper	9.4	9.3	9.2	9.5	9.5	9.3	9.1
Chemicals	24.0	24.6	25.3	27.4	26.5	25.8	25.8
Motor Vehicles	5.3	4.7	5.5	5.5	6.5	4.9	5.7

Source: Data Resources, Inc., Jan. 16, 1984

slow down, from over 20% in 1983 to about 10% this year as railroads face equipment

constraints and work to improve profitability to justify new investments.

Revenue freight carloadings

Commodity	Jan. 7 week	% change from 1983	Dec. 31 week	% change from 1982	Dec. 24 week	% change from 1982	Dec. 17 week	% change from 1982
Grain	28 770	8 1	20 370	20 0	22 567	17 3	29 571	26 2
Other farm products	4 147	(2 9)	2 895	(24 8)	3 219	(11 3)	3 801	(25 6)
Metallic ores	9 486	(9 3)	9 358	(3 2)	11 775	13 7	13 857	17 2
Coal	82 332	(12 3)	56 262	(17 8)	83 406	2 7	108 913	5 8
Crushed stone, gravel and sand	6 204	(5 4)	4 315	(17 6)	6 879	59 9	9 126	24 2
Nonmetallic minerals	9 295	4 5	8 377	(7 4)	10 346	23 9	11 118	11 1
Grain mill products	10 051	(14 9)	8 253	(17 8)	10 364	3 0	10 862	(10 7)
Food and kindred products	9 158	(24 5)	7 335	(25 1)	9 688	(3 9)	11 319	(4 6)
Primary forest products	11 868	(11 6)	7 186	(23 5)	11 250	45 4	14 514	22 3
Lumber and wood products (except furniture)	5 167	(5 3)	4 466	(5 0)	6 773	36 4	6 988	12 1
Pulp, paper and allied products	12 708	(12 1)	10 291	(0 7)	14 918	21 7	15 141	1 4
Chemicals and allied products	21 032	(0 2)	20 031	(0 4)	22 563	38 8	23 468	23 9
Petroleum products	4 066	(14 6)	3 667	(7 4)	4 542	20 8	4 788	1 5
Stone, clay and glass products	7 960	(6 2)	5 999	(12 9)	7 559	16 0	9 820	25 1
Coke	4 432	5 5	4 206	14 8	4 787	15 4	5 268	44 1
Metals and products	7 246	12 1	7 639	52 4	8 248	75 4	8 553	30 1
Motor vehicles and equipment	13 379	21 0	7 645	46 7	16 468	90 1	21 575	61 6
Waste and scrap materials	6 694	11 0	4 882	18 4	7 641	61 3	9 195	41 7
Forwarder and shipper assn. traffic	7 573	27 0	6 067	22 0	8 377	42 2	10 015	34 2
All other carloads	40 720	7 0	33 793	12 6	48 277	37 1	54 985	15 0
LCL traffic	180	(81 5)	126	(75 5)	200	(66 5)	231	(76 8)
Total Cars Loaded	302 468	(4 0)	233 163	(0 7)	319 847	21 8	383 108	14 2

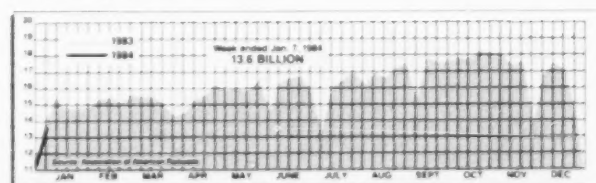
Estimated revenue ton-miles (billions)	1983	1982	% change from 1982
52 weeks	825.5	797.8	3.5
	1984	1983	% change from 1983
1 week	13.6	14.1	(3.2)

Piggyback loadings

Week ended	Cars loaded 1983	% increase from 1982	Trailers containers 1983	% increase from 1982
December 10	48 965	20 1	89 620	24 7
December 17	50 276	21 3	91 791	25 5
December 24	43 456	37 9	79 388	43 5
December 31	30 966	11 1	56 463	18 6
Cumulative total, 52 weeks	2 338 527	21 8	4 078 454	20 1

Rail freight traffic trends

Billion ton miles (Estimated)



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Watching Washington

18 railroads post positive returns

The Class I railroads—individually and as a group—fell far short in 1983 of earning the 17.8% return on investment (ROI) that Congress has said they need to earn. But 18 out of the 30 Class I's reporting to the ICC last year did earn some kind of positive ROI for the 12 months ended Sept. 30, a not inconsiderable feat considering the state of the national economy, which was just then beginning to recover from its worst recession since the Great Depression. For the industry as a whole, the rate of return for that period was 3.13%. Railroads whose positive ROI's contributed to that average are listed below:

Burlington Northern	7.82
Missouri-Kansas-Texas	7.24
Kansas City Southern	6.01
Chicago & North Western	6.01
Southern	5.78
Missouri Pacific	4.76
Norfolk & Western	4.52
Chesapeake & Ohio	4.27
Union Pacific	4.26
Illinois Central Gulf	4.10
Seaboard System	3.52
Denver & Rio Grande Western	3.43
Elgin, Joliet & Eastern	2.78
St. Louis Southwestern	2.54
Santa Fe	2.38
Soo Line	2.24
Conrail	1.56
Bessemer & Lake Erie	0.05

NS and CSX eye Conrail

It was too early to call it a mating dance. But both Norfolk Southern and CSX in January went public with cautious expressions of interest in forming a union with Conrail.

Norfolk Southern was first, with a tersely worded Jan. 6 statement that it was starting studies "looking toward the possible inclusion of Conrail" in its system.

CSX's immediate comment was "no

comment"—but five days later CSX Chairman and CEO Hays T. Watkins said his board of directors had decided to undertake a "thorough review" of Conrail with an eye to possible acquisition.

Congress has ordered Conrail sold only as a single, operating entity, at least through mid-1984, if it passes certain profitability tests—and Conrail has so far passed those tests with ample margins. The railroad had profits estimated at \$275 million in 1983.

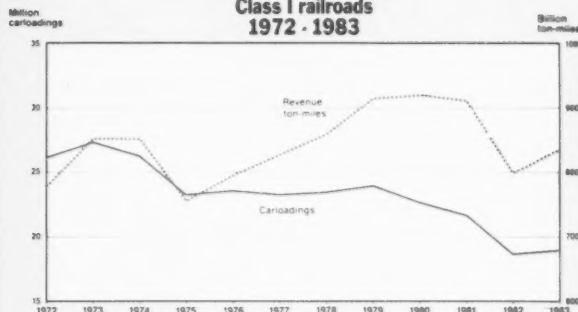
Until last month, only two formal expressions of interest in Conrail had been made. One came from the Santa Fe, which subsequently backed off after it reached a merger agreement with Southern Pacific. The other was an offer from Conrail employees—a package of a little bit of cash and a lot of wage concessions and tax-benefit waivers which has not aroused much excitement at DOT.

Earlier this year, then-FRA Administrator Robert W. Blanchette said the purchaser of Conrail would have to have "a deep pocket" because "there are no refunds on this sale." Both NS and CSX, which are among the most prosperous railroads in North America, would seem eminently qualified on that score.

But competitive aspects of a Conrail takeover by either of its big neighbors to the south are something else, as a number of railroad financial analysts have pointed out. The competitive issue is also being seized upon by those who are promoting an employee buyout. Brian Freeman, financial adviser to the Railway Labor Executives' Association, which put together the employee bid (involving only \$500 million in cash but valued by RLEA at a total of \$2 billion), had this to say after NS and CSX made their tentative moves: "I would not envision purchase by either of them, because that would be counter to the interest of the public, rail service in the Northeast, and the employees. The whole purpose of the government investing \$7 billion since 1976 was to maximize service. Acquisition by either of the railroads would result in a substantial reduction in service."

Freight railroading in 1983: A statistical review

**Freight traffic trends
Class I railroads
1972-1983**

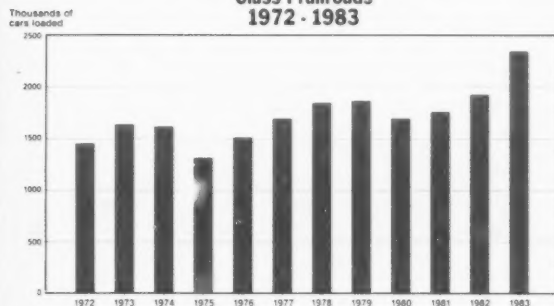


**Methods of shipping motor vehicles from factories
1972-1982**

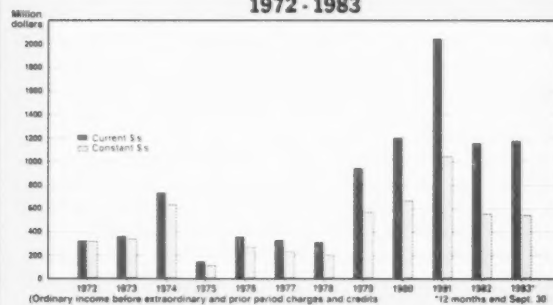
Year	Vehicles shipped	Highway %	Railroad %
1972	11,270,000	47.8	52.2
1973	12,637,000	48.0	52.0
1974	10,058,000	44.8	55.2
1975	8,985,000	46.4	53.9
1976	11,477,000	48.5	51.5
1977	12,639,000	49.3	50.7
1978	12,871,000	47.9	52.1
1979	11,456,000	50.1	49.9
1980	8,067,000	46.8	53.2
1981	7,956,000	43.6	56.4
1982	6,956,000	46.1	53.9

Source: Motor Vehicle Manufacturers Association of the United States

**Revenue Carloadings of T-O-F-C traffic
Class I railroads
1972-1983**



**Net income
Class I railroads
1972-1983**



(Ordinary income before extraordinary and prior period charges and credits) '12 months end Sept. 30

**Freight traffic
1972-1983**

Year	Revenue carloadings (thousands)	Piggyback carloadings (thousands)	Revenue ton-miles (millions)
1972	26,105	1,448	776,746
1973	27,338	1,631	851,809
1974	26,184	1,610	850,961
1975	23,218	1,308	754,252
1976	23,457	1,506	794,059
1977	23,173	1,689	826,292
1978	23,355	1,841	858,105
1979	23,892	1,858	913,669
1980	22,598	1,687	918,621
1981	21,613	1,752	910,169
1982	18,498	1,920	797,759
1983	18,800	2,350	*825,500

* Estimated

**Condensed income account:
1972, 1982, 1983**

	1972 (millions)	1982 (millions)	12 mos. to 9/30/83 (millions)
Total Operating Revenues	\$13,410	\$27,504	\$26,536
Total Operating Expenses	12,528	26,490	25,213
Net Operating Revenues	881	1,013	1,323
Other Income	393	1,667	1,389
Miscellaneous Deductions	101	215	231
Interest Charges & Amortization	568	1,085	1,037
Tax Accruals & Other Deductions	287	227	274
Net Ordinary Income	319	1,152	1,170
Net Railway Operating Income	654	742	1,044
Rate of Return	2.34%	2.11%	3.16%

Carloadings of major commodities 1983 vs. 1982

	1983 Cars	1982 Cars	I D	Incr/Decr. 1983 vs. 1982	
				Cars	Percent
Grain	1,379,864	1,265,357	I	114,507	9.0
Other farm products	205,009	217,748	D	12,739	5.9
Metallic ores	823,569	814,872	I	8,697	1.1
Coal	5,210,459	5,628,723	D	418,264	7.4
Crushed stone, gravel and sand	503,360	475,487	I	27,873	5.9
Nonmetallic minerals	585,106	504,013	I	81,093	16.1
Grain mill products	593,047	619,242	D	26,195	4.2
Food and kindred products	605,876	681,137	D	75,261	11.0
Primary forest products	738,536	766,097	D	27,561	3.6
Lumber and wood products except furniture	367,864	308,208	I	59,656	19.4
Pulp, paper and allied products	778,126	829,139	D	51,013	6.2
Chemicals and allied products	1,198,939	1,117,290	I	81,649	7.3
Petroleum products	239,126	243,746	D	4,620	1.9
Stone, clay and glass products	533,574	508,869	I	24,705	4.9
Coke	261,623	231,854	I	29,769	12.8
Metals and products	433,505	454,063	D	20,558	4.5
Motor vehicles and equipment	867,157	713,269	I	153,888	21.6
Waste and scrap materials	420,594	404,564	I	16,030	4.0
Forwarder and shipper association traffic	452,809	428,874	I	23,935	5.6
All other carloads	2,586,759	2,219,459	I	367,300	16.5
LCL traffic	15,250	66,154	D	50,904	76.9
Total Cars Loaded	18,800,172	18,498,165	T	302,007	1.6

Capital expenditures and retained funds 1972 - 1983

Gross capital expenditures

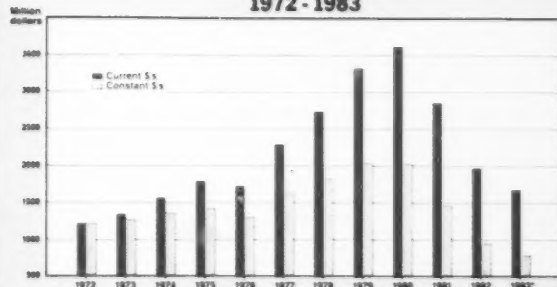
Year	Rolling stock (millions)	Other facilities (millions)	Total (millions)	Retained funds ¹ (millions)	Excess of cap- ital expendi- tures over retained funds (millions)
1972	\$ 848	\$ 368	\$ 1,216	\$ 923	\$ 293
1973	893	449	1,342	964	378
1974	1,038	527	1,565	1,091	475
1975	1,303	486	1,790	622	1,168
1976	1,175	550	1,725	683	1,042
1977	1,540	751	2,291	763	1,527
1978	1,883	855	2,738	727	2,011
1979	2,285	1,039	3,323	1,390	1,933
1980	2,346	1,275	3,621	1,839	1,782
1981	1,521	1,334	2,855	3,130	(276) ²
1982	713	1,262	1,975	1,725	250
12 mos. to 9/30/83	421	1,259	1,681	1,922	(241) ²

¹ Retained funds represent income before extraordinary items, plus deferred taxes and depreciation and retirement charges, less cash dividends and equity in undistributed earnings of affiliated companies.

² The reversal of a long-term trend in two of the past 11 years was due to increases in ordinary income and deferred taxes and declines in capital outlays resulting from equipment surpluses.

Note: Capital expenditures of Class I railroads do not include expenditures for railroad equipment made by private car companies and lessors.

Capital expenditures Class I railroads 1972 - 1983



*12 months ended Sept. 30

Operating revenues 1972, 1982, 1983

	1972 (millions)	1982 (millions)	12 mos. to 9/30/83 (millions)
Freight	\$12,670	\$25,627	\$25,129
Passenger	257	573	367
All other	483	1,303	1,040
TOTAL	\$13,410	\$27,504	\$26,536

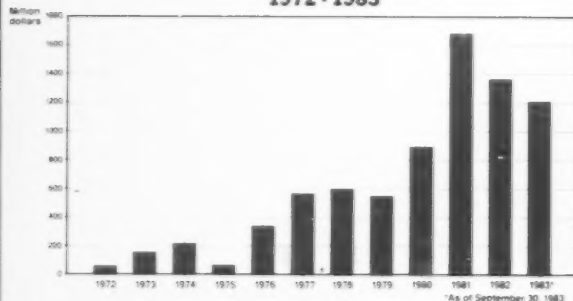
Note: Mail and express included in freight revenue.

Railway current ratio 1972 - 1983

Dec. 31	Current assets (millions)	Current liabilities ¹ (millions)	Current ratio
1972	\$3,611.6	\$3,672.3	1.0
1973	4,055.9	3,898.0	1.0
1974	4,553.2	4,333.7	1.1
1975	4,640.8	4,572.9	1.0
1976	5,292.8	4,950.1	1.1
1977	5,985.7	5,414.8	1.1
1978	6,873.5	6,270.8	1.1
1979	7,779.6	7,224.5	1.1
1980	8,676.4	7,779.0	1.1
1981	9,665.1	7,973.5	1.2
1982	8,813.4	7,441.7	1.2
9/30/83	8,281.5	7,064.1	1.2

¹ Includes debt due within one year.

Net working capital 1972 - 1983



¹ As of September 30, 1983.

Net railway operating income, rate of return on net investment and net income 1972 - 1983

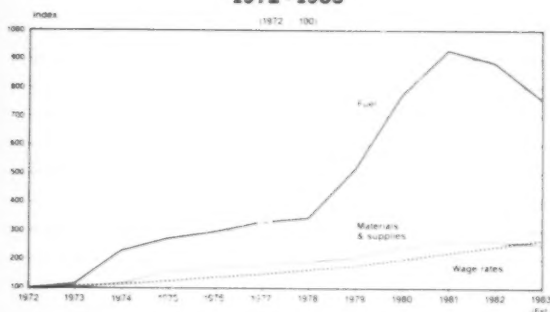
Year	Net railway operating income ^a (millions)	Rate on net return on net investment ^a	Net income after fixed charges ^b (millions)	Net income in constant 1972 dollars (millions)
1972	\$ 654	2.34%	\$ 319	\$ 319
1973	650	2.33	359	340
1974	768	2.70	730	635
1975	351	1.20	144	115
1976	452	1.60	355	269
1977	343	1.24	326	233
1978	427	1.52	307	204
1979	837	2.87	938	574
1980	1,312	4.13	1,192	668
1981	1,361	3.98	2,041	1,046
1982	742	2.11	1,152	557
12 mos. to 9/30/83	1,044	3.16	1,170	548

^a After provision for deferred taxes.

^b After provisions for deferred taxes and including equity in undistributed earnings of affiliated companies.

Note: Statistics shown above and elsewhere in the tables are for Class I line-haul railroads, excluding National Railroad Passenger Corp. (Amtrak) and Auto Train Corp., unless otherwise indicated.

Railroad cost trends Class I railroads 1972 - 1983



Prices and revenue averages 1972 - 1983

Year	Producer price index for railroad equipment ¹ (1972 = 100)	Price index for total railroad freight ¹ (1972 = 100)	Railroad revenue per ton-mile (cents)	1972 = 100
1972	100.0	100.0	1.618	100.0
1973	104.7	102.5	1.617	99.9
1974	127.3	118.7	1.853	114.5
1975	156.3	134.3	2.041	126.1
1976	168.3	148.0	2.191	135.4
1977	181.4	157.9	2.286	141.3
1978	196.3	169.0	2.358	145.7
1979	215.5	192.9	2.599	160.6
1980	243.3	225.6	2.852	176.3
1981	261.1	259.8	3.155	195.0
1982	269.2	278.7	3.212	198.5
1983 est	274.4	281.9	3.205	198.1

¹ BUREAU OF ECONOMIC ANALYSIS, USDO

Spot price indices of fuel and materials and supplies (1977 = 100)

Date	Diesel fuel	Materials and supplies Forest products	Iron & steel	Misc.	Total materials and supplies Excluding fuel	Including fuel
8 15 81	268.2	156.4	148.1	145.6	148.0	200.2
11 15 81	287.7	155.3	147.3	148.4	148.6	200.2
2 15 82	283.0	155.5	143.1	146.9	146.1	197.0
5 15 82	258.0	153.1	141.1	147.3	145.0	187.1
8 15 82	268.9	152.0	140.7	147.5	144.7	191.1
11 15 82	283.0	149.2	135.1	146.8	141.4	193.9
12 15 82	236.4	151.0	133.1	145.9	140.4	176.5
5 15 83	230.1	151.2	130.9	145.1	139.1	173.4
8 15 83	236.7	155.4	129.1	144.7	138.9	175.6
11 15 83	240.0	154.7	129.1	141.6	137.2	175.7

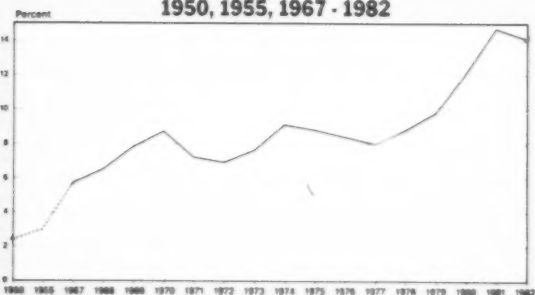
New and rebuilt equipment installed 1972 - 1983

Year	Freight Cars	Passenger-train cars	Diesel-electric units
1972	49,983	347	1,577
1973	59,170	92	1,384
1974	67,409	100	1,395
1975	73,992	272	840
1976	53,630	358	567
1977	53,817	158	992
1978	68,774	44	1,378
1979	96,532	116	1,978
1980	86,628	160	1,666
1981	45,925	119	686
1982	18,736	102	501
11 mos 1983	8,127	n.a.	209

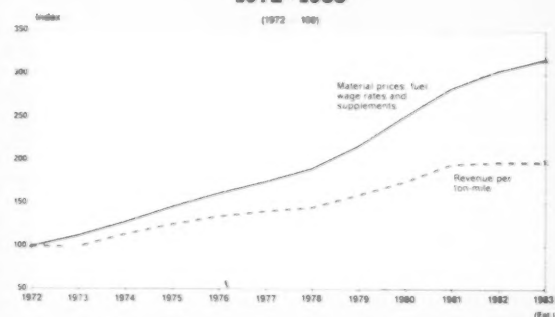
n.a. Not available

Note: Freight-car installations include cars of all railroads and private car lines. Passenger-train cars and diesel-electric unit installations include Amtrak for all years and Auto Train for the years 1972-1977.

Average interest rates on equipment obligations issued Class I railroads 1950, 1955, 1967 - 1982



Revenue and cost trends Class I railroads 1972 - 1983



Rail revenue adequacy standard 1978 - 1982

Year	ICC Approved Cost of Capital			Total	Rail Rate of Return on Net Investment ¹
	Debt	Equity	Ratio		
1978	7.0%	13.0%	40:60	10.6%	1.52%
1979	9.0	13.5	40:60	11.7	2.87
1980	10.0	13.5	40:60	12.1	4.13
1981	13.7	18.3	40:60	16.5	3.98
1982	14.0	19.8	37:63	17.7	2.11

¹ Net Railway Operating Income as a percent of average net investment, beginning and end of year.

Railroad cost recovery index 1972 - 1983

(1977 = 100)

Year	Labor (Wages & Supplements)	Fuel	Materials & Supplies	Labor, Fuel & MS Combined	Other Costs	Railroad Cost Recovery Index
1972	61.0	30.1	54.7	57.0	n.a.	n.a.
1973	69.1	35.0	56.6	64.0	n.a.	n.a.
1974	75.2	69.8	65.4	73.1	n.a.	n.a.
1975	82.3	82.6	87.6	83.2	n.a.	n.a.
1976	92.2	89.9	93.6	92.2	n.a.	n.a.
1977	100.0	100.0	100.0	100.0	100.0	100.0
1978	109.8	104.4	106.2	108.6	108.8	108.5
1979	120.8	155.5	116.4	123.5	119.0	122.1
1980	132.5	233.1	134.2	143.3	132.6	140.1
1981	149.4	280.2	145.2	162.2	147.2	157.7
1982	167.0	267.1	146.3	173.6	155.7	168.3
1983	181.5P	232.2	140.0	179.1P	n.a.	n.a.

n.a. - Not Available
P - Preliminary

NOTE

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Cov. 1, p. 4-5, 12, 17.

March 1984

RAILWAY AGE

...for the new age of railways

For South Shore
riders, "a different world"

3/27/84

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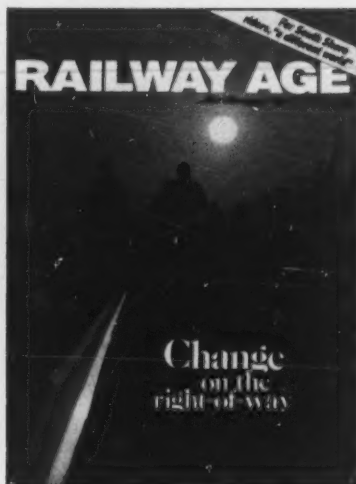


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Change on the right-of-way

RAILWAY AGE

...for the new age of railways



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Maintaining track to the exacting standards of mega-railroading demands better materials, better machines—and, above all, better productivity.

41 A railroader's guide to Washington

The *Railway Age* Unit Rail Anchor directory offers a comprehensive listing, with names and phone numbers, of key contacts in the nation's capital.

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63 Deseret Western: One of a kind

The nation's newest railroad, a western coal hauler, borrowed the best ideas from other electrified lines, and then added its own variations.

65 Track Train Dynamics Newsletter

The case for a High Productivity Integral Train will be presented at a meeting in Chicago April 3. Present and potential suppliers are invited.

69 CSS&SB: A new world

New cars, a new yard, and a refurbished shop have transformed the South Shore from a veritable museum into a smoothly-functioning interurban.

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Inside

The changing right-of-way

It is not difficult to illustrate the dramatic change that has taken place on the railroad right-of-way in the last century or so. Just look at the pictures below, which graphically depict the change in emphasis from muscle to machine. (That change, incidentally, has come about fairly recently: It was only 30-odd years ago that the Southern's Bill Brosnan drew his own rough sketch of the first track machine—precursor of an m/w mechanization trend that has revolutionized maintenance practices. And let the record show that Southern—now part of Norfolk Southern—continues to set a pioneering pace: Last year it fielded the first fully-automatic track machine, a tamper, with results so successful that an additional six automatic tampers have been ordered; the technology is now being extended to automatic machines for applying and tightening rail anchors.)



LUTHER S. MILLER

Other changes are taking place on the right-of-way that are less easy to depict graphically. They are taking place, for example, in railroad computer rooms, where maintenance cycles are now electronically plotted; where track equipment is subjected to sophisticated tests for performance and return on investment.

In this issue's cover article—Change on the Right-of-Way—Senior Editor Gus Welty explores a number of areas that are not easily susceptible to pictorial illustration—for example, the rising role of rail lubrication (which could cut fuel costs by up to 10%, according to some projections); more efficient m/w equipment shops; m/w machine standardization; better material handling. And more.

This third article in our year-long series on *Change* starts on p. 37. Coming in April: Change on the Union Pacific.



Laying track in the 1870s...



...and in the 1980s

Market Outlook

Equipment

New York Metropolitan Transportation Authority: Ordered 16 push-pull commuter cars, valued at more than \$16 million (Canadian), from Bombardier for service on Metro North's New Haven Line. MTA earlier ordered 19 similar cars for Metro North's Upper Hudson line (RA, Jan., p. 12).

Ortner Freight Car Co.: Has received orders for 757 cars costing \$36.1 million, with options for 195 additional cars priced at \$14.9 million. The purchasers: U.S. Army, 174 heavy-duty flat cars (with option for 150 more) for delivery in late 1984 and early 1985; Tennessee Valley Authority, 198 Rapid Discharge coal cars for delivery in the second and third quarters of 1984; Lower Colorado River Authority, 100 rotary dump gondola cars for delivery in the first half of 1984; Florida East Coast, 100 Rapid Discharge aggregate cars for delivery in the second quarter of 1984; Tucson Electric Power Co., 185 rotary dump gondola cars for delivery starting in January 1985, with an option for 45 additional cars. Also, Intermountain Power Project has announced that it plans to order 273 aluminum Rapid Discharge hopper cars from Ortner.

Turkish Railways Enterprise: Ordered 52 diesel-electric locomotives from General Motors. GM's Electro-Motive Division will build 39 units (designated G26CW-2) and provide the other 13 as partial knock-down kits or component sets for overseas assembly. Deliveries on the order, which is valued at about \$50 million, are scheduled for fourth-quarter 1984. Also involved is a long-term technical assistance program leading to local production of locomotives.

Facilities

Greater Cleveland Regional Transit Authority: Union Switch & Signal Division of American Standard is the apparent low bidder, at \$6.8 million, for signaling CCRTA's West Park Station to downtown Cleveland Union Terminal Line.

Freight cars and locomotives

	DELIVERED		December 1983
	January 1984	1983	
Built new by carbuilders	415	440	745
Built new in RR shops	0	54	0
Built new—total	415	494	745
Rebuilt	0	0	0
TOTAL DELIVERED	415	494	745
Locomotives (new and rebuilt)	15	10	109

ORDERED			
To be built new by carbuilders	2,736	501	805
To be built new in RR shops	0	0	0
To be built new—total	2,736	501	805
To be rebuilt	0	0	0
TOTAL ORDERED	2,736	501	805

	ON ORDER AND UNDELIVERED		January 1 1984
	February 1 1984	1983	
To be built new by carbuilders	5,650	4,155	3,271
To be built new in RR shops	0	146	0
To be built new—total	5,650	4,301	3,271
To be rebuilt	0	0	0
TOTAL ON ORDER	5,650	4,301	3,271
Locomotives (new and rebuilt)	85	30	91

Twelve-month locomotive figures for 1983, which were unavailable at press time for the February issue, were: Deliveries, 318 (compared with 520 in 1982); and Average Backlog, 116 (compared with 137 in 1982).

Estimated ownership—all revenue freight cars

January 1, 1984 vs. January 1, 1983

		Box	Covered Hoppers	Gondola	Hopper	Flat	Refg.	All Others	TOTAL
Class I RRs	1984	271,396	164,466	129,423	282,930	83,757	53,281	21,912	1,007,165
	1983	278,024	166,150	134,763	293,306	86,011	57,466	23,296	1,039,016
Class II & S&T Cos.*	1984	48,953	9,632	10,257	11,209	5,010	3,286	3,048	91,395
	1983	49,613	9,336	10,349	11,238	4,667	3,407	2,842	91,452
Railbox-Railgon	1984	15,088		3,998					19,086
	1983	24,924		3,998					28,922
RRO&C** Refgs.	1984						5,372		5,372
	1983						4,313		4,313
Private	1984	319	129,074	27,876	21,666	53,524	1,766	185,035	419,260
	1983	408	130,736	27,821	21,098	53,830	2,857	187,084	423,834
GRAND TOTAL	1984	335,756	303,172	171,554	315,805	142,291	63,705	209,995	1,542,278
	1983	352,969	306,222	176,931	325,642	144,508	68,043	213,222	1,587,537

*Class II railroads and switching terminal companies.

**Railroad owned and controlled refrigerator car lines.

Source: Transportation Division, AAR.

Market Indicators

DRI Railroad Industry Monitor

As the recovery continues, the need for change in national economic policy is growing. The short-term outlook is good, with recovery beginning to touch industries like steel that were not helped by the early stages of recovery, but record federal deficits threaten to choke off growth after 1985. By keeping interest rates and the foreign exchange value of the dollar high, the federal deficits strike two blows at the economy, reducing domestic demand for interest-sensitive goods like autos and houses and reducing export demand for U.S. products.

The DRI rail traffic forecast reflects the impacts of the deficits. Grain traffic will be weak in the second half of 1984, as the strong dollar continues to make it hard for U.S. grains to compete in world markets. Coal traffic will rebound as domestic de-

	1983:2	1983:3	1983:4	1984:1	1984:2	1984:3	1984:4
Economic Indicators (Annualized rates)							
Real GNP (% change)	9.7	7.6	4.5	5.6	3.9	4.3	4.1
Industrial production (1967 = 1.0) ..	1.44	1.52	1.56	1.59	1.61	1.63	1.65
Housing starts (mil. units)	1.68	1.79	1.69	1.77	1.80	1.82	1.74
Retail car sales (mil. units)	9.2	9.3	9.9	9.8	10.1	10.4	10.5
Raw steel production (mil. tons)	21.7	21.1	22.9	26.3	28.1	25.6	25.8
Total Class I Rail Traffic							
(millions of tons)	312.8	329.9	326.4	320.9	340.2	338.2	338.0
Key Commodities							
Grain	26.7	36.8	36.2	34.8	32.1	27.5	29.9
Coal	118.0	124.0	124.1	122.1	129.8	130.7	138.2
Pulp & paper	9.4	9.3	9.2	9.5	9.5	9.2	9.1
Chemicals	24.0	24.5	25.5	27.7	26.8	26.0	26.2
Motor vehicles	5.3	4.7	5.6	5.5	6.3	4.9	5.6

Source: Data Resources, Inc., Feb. 10, 1984

mand for electricity rises, but high interest rates will limit the demand for new housing and keep lumber carloadings from growing much beyond present levels. Interest rates

will also continue to make shippers put a premium on high levels of service, a major factor behind the decline of rail paper traffic.

Revenue freight carloadings

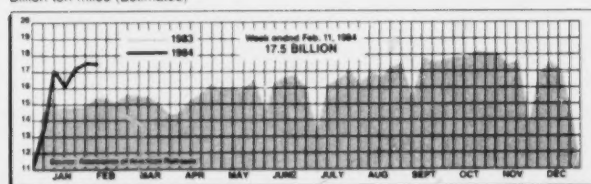
Commodity	Feb. 11 week	% change from 1983	Feb. 4 week	% change from 1983	Jan. 28 week	% change from 1983	Jan. 21 week	% change from 1983	Jan. 14 week	% change from 1983
Grain	29,523	5.9	32,426	32.0	31,502	29.3	30,809	12.8	33,186	16.4
Other farm products	5,186	43.1	4,879	13.5	5,151	(15.9)	4,488	(27.9)	5,315	17.3
Metallic ores	13,558	33.9	11,732	26.4	12,718	19.3	13,226	24.9	11,725	5.9
Coal	112,822	17.7	112,354	17.4	108,003	12.9	97,506	1.2	107,940	5.0
Crushed stone, gravel and sand ..	8,439	19.5	8,653	16.9	7,952	15.9	7,456	12.7	7,792	5.0
Nonmetallic minerals	12,220	18.8	12,804	22.3	11,635	8.3	12,050	18.3	11,364	17.3
Grain mill products	12,048	0.0	11,982	0.7	12,341	0.1	12,215	(0.5)	12,075	3.2
Food and kindred products	10,825	19.2	11,443	(13.5)	11,087	(11.1)	11,017	(11.8)	11,844	3.2
Primary forest products	14,088	4.9	14,767	3.0	12,872	(10.9)	12,847	(4.6)	13,738	9.9
Lumber and wood products (except furniture)	7,679	10.5	7,696	10.6	7,517	2.7	6,982	(0.2)	7,019	6.8
Pulp, paper and allied products ..	15,233	1.1	15,235	(2.0)	15,258	0.4	14,602	(2.8)	14,750	0.9
Chemicals and allied products	26,239	11.6	25,960	12.6	25,684	14.6	24,488	10.4	25,199	6.0
Petroleum products	5,236	18.1	5,103	22.6	5,309	11.8	5,050	2.4	5,222	6.7
Stone, clay and glass products	10,150	17.7	10,461	17.8	9,154	6.7	8,561	1.1	9,793	12.2
Coke	5,059	14.4	4,786	12.1	4,534	12.0	4,542	6.0	4,763	21.5
Metals and products	10,009	9.1	10,516	19.9	9,503	27.1	9,147	35.6	9,164	32.7
Motor vehicles and equipment	21,135	35.1	20,496	34.0	20,474	31.8	20,600	47.7	19,831	48.0
Waste and scrap materials	10,653	39.5	10,407	46.9	10,234	50.3	9,967	40.1	9,832	39.0
Forwarder and shipper assn. traffic ..	10,401	8.8	10,544	18.1	10,373	18.8	9,687	34.6	9,505	32.7
All other carloads	54,295	10.5	54,654	17.0	54,409	18.9	51,341	20.6	51,768	18.2
LCL traffic	284	33.3	317	52.4	320	45.5	283	81.4	254	29.6
Total Cars Loaded	395,082	13.4	397,215	16.5	386,030	13.4	66,864	9.5	382,079	18.1
Estimated revenue ton-miles (billions)										
6 weeks	1984	1983	% change from 1983							
	99.1	89.6	10.6							

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers/containers 1984	% increase from 1983
January 7	37,792	10.5	65,853	13.1
January 14	47,580	19.7	84,367	26.9
January 21	46,729	23.0	81,607	25.8
January 28	50,017	18.9	87,280	20.2
February 4	50,502	19.6	89,026	22.8
Cumulative total, 5 weeks	233,140	18.8	408,561	22.1

Rail freight traffic trends

Billion ton miles (Estimated)



NOTE

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April 1984

Amtrak: At 13,
a going concern

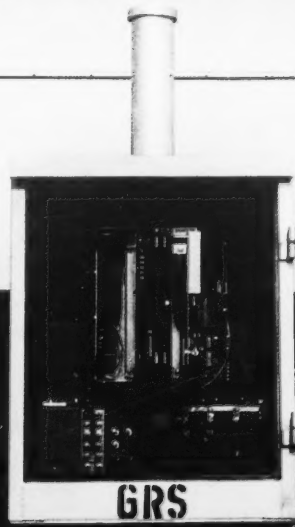
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**Change in the '80s:
Riding the fast track with UP**

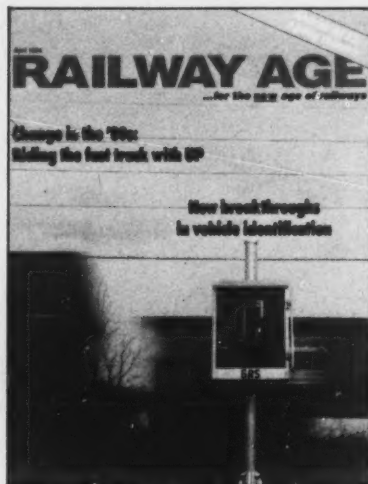
**New breakthroughs
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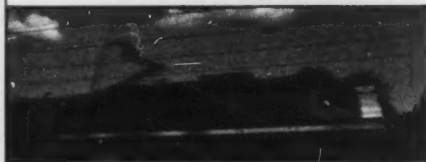
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Cover: GRS Identifier wayside detector photographed by Roy Blanchard. *Page 40.*



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35 Change in the '80s: UP rides the fast track

As it seeks to maximize the benefits of deregulation and merger, UP takes a hard look at the "total economics" of any given situation.

40 Breakthroughs in vehicle identification

New, non-optical automatic vehicle identification systems are being developed, tested and implemented; they promise to be much more reliable than optical aci.

50 Racking up the loaded miles

Autotrack pools are saving empty miles and lots of money; a distribution program launched in 1979 and refined during the recession is being expanded.

54 In search of a new coal-burner

Three specific design proposals have been made for new, energy-efficient coal-powered locomotives. But before they can be built, funding must be found.

58 Amtrak: Stability at 13

Amtrak operations are no longer hand-to-mouth: The railroad is using assets creatively. NECIP is almost finished, and service is improving.

62 C&NW rebuilds a piece of the "Rock"

North Western is investing \$57 million to increase the capacity of its new north-south main line—the former Rock Island "spine."

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Inside

Upbeat days at the UP



LUTHER S. MILLER

The winds of change that are sweeping the railroad industry were not stirred up entirely by deregulation and merger, although those have certainly been two of the principal elements at work. The deep recession of the early '80s taught the railroads to do more with less, and that lesson has not been forgotten: This year the railroads are handling 10% more traffic than a year ago, with 3.3% fewer employees. Another lesson the railroads learned, the hard way, is that a neglected roadway can be the road to reorganization. Jolted by the wave of bankruptcies that spread from East to Midwest in the '70s, the surviving roads scraped the bottom of the till to put their fixed plant back into shape, even before there was any guarantee that they would be able to use that plant to maximum competitive advantage. Meantime, there has been a revision in track-accounting methods that permits railroads to capitalize maintenance outlays that used to be charged to operating expense; the result will be a greater stability in m/w programs that were once subject to the caprices of cash flow.

Altogether, it has been a time of pervasive change that has created an extraordinary opportunity for railroads to provide competitive service at competitive cost. And few railroads have put it all together with more sophistication—and dedication to the "total economics" of the enterprise—than has the Union Pacific System. Senior Editor Gus Welty's report on Change at the UP starts on p. 35.

Coal power: Concepts in search of cash

At least three railroads—Chessie, Norfolk Southern, and Burlington Northern, big coal-haulers all—are trying to promote the comeback of coal as a locomotive fuel.

Current interest in coal-fired power was sparked by American Coal Enterprises' unveiling, nearly four years ago, of specs for the ACE 3000 reciprocating steam locomotive (RA, Oct. 13, 1980, p. 36). Last year, after many months of negotiation, the ACE promoters seemed ready to proceed with the building of a prototype, helped along by partners Babcock & Wilcox, Burlington Northern, and Chessie. But Babcock & Wilcox withdrew from the group late in the year, and subsequently BN pulled out.

Does all of this mean that the ACE 3000 is dead? No. Recent developments have put new life into the proposal—and meanwhile, other concepts are being actively pursued (though most of them suffer from a lack of ready cash). Associate Editor John Armstrong's summary of the situation begins on p. 54.

Market Outlook

Equipment

CN Rail: Placed orders for 48 locomotives valued at \$80 million (Canadian)—29 3,500-hp SD-50s from General Motors of Canada, and 19 3,000-hp units from Bombardier.

General Electric: A contract was awarded to G & O Manufacturing Co. to supply engine cooling radiator cores for 220 diesel locomotives GE is to supply to the Peoples Republic of China.

Transamerica Transportation Services: Ordered 1,800 45-foot-long, 102-inch-wide piggyback trailers from Budd's Trailer Division at a cost of more than \$18 million—one of the largest orders ever received by the division.

Union Pacific System: Ordered 350 100-ton covered hopper cars for cement service from Greenville Steel Car at a cost of \$11.2 million; 325 enclosed bi-level autoracks from Thrall Car and Portec's Railcar Division at a cost of \$7.6 million; and 150 refrigerated trailers from Fruehauf, with reefer units from Carrier Transcold, at a cost of \$5.4 million.

Facilities

Conrail: Is spending \$9.9 million for track improvements on its Delmarva Peninsula lines. Included are installation of more than 59 miles of cwr and 13,300 crossties, surfacing of 90 miles, and repaving of 79 crossings.

CP Rail: Will install 23 "talking" hotbox detectors this year, mainly in western Canada. The railroad already has installed 232 visual-display or printout hotbox detectors on lines near population centers at a cost of \$25 million. The units to be installed this year will transmit voice messages to the locomotive cab giving the all clear to the crew, or informing them of the number, type and location of defects spotted.

Freight cars and locomotives

	DELIVERED		January	Two Months	
	1984	1983		1984	1983
Built new by carbuilders	528	411	415	943	851
Built new in RR shops	0	36	0	0	90
Built new—total	528	447	415	943	941
Rebuilt	0	0	0	0	0
TOTAL DELIVERED	528	447	415	943	941
Locomotives (new and rebuilt)	33	26	15	48	36

	ORDERED		January	Two Months	
	1984	1983		1984	1983
To be built new by carbuilders	1,523	297	2,736	4,259	798
To be built new in RR shops	0	2	0	0	2
To be built new—total	1,523	299	2,736	4,259	800
To be rebuilt	0	0	0	0	0
TOTAL ORDERED	1,523	299	2,736	4,259	800

	ON ORDER AND UNDELIVERED		February 1	Average Backlog	
	1984	1983		1984	1983
To be built new by carbuilders	6,548	4,041	5,553	6,099	4,098
To be built new in RR shops	0	12	0	0	129
To be built new—total	6,548	4,153	5,553	6,099	4,227
To be rebuilt	0	0	0	0	0
TOTAL ON ORDER	6,548	4,153	5,553	6,099	4,227
Locomotives (new and rebuilt)	81	17	85	83	24

Source: Transportation Division, AAR

Metro-North Commuter Railroad: Awarded a \$4.9-million contract to Railway Systems Designs, Inc. (RSD) of Wilmington, Del., for design of a new signal system for the Harlem and Hudson lines. RSD is a subsidiary of the minority-owned firm, SAB Engineering and Construction, Inc., of Media, Pa. Under an earlier contract, RSD designed a compatible signal system for Metro-North's New Haven line.

Metropolitan Atlanta Rapid Transit Authority: Awarded a \$14.8-million contract to Moseman Construction Co. for work on a segment of the South Line between Lakewood/Fort McPherson and East Point stations.

New York DOT: A consortium headed by Schiavone Construction Co. and includ-

ing Raymond International Builders Inc. and Kiewit Eastern Co. has submitted the apparent low bid, \$54 million, for the Oak Point Rail Link, which is designed to ease the movement of freight trains into and out of New York City.

Sacramento Transit Development Agency: Awarded a \$3.473 million contract to Controlled Power Corp. of Massillon, Ohio, for the supply of 14 one-megawatt electrical substations to convert high-voltage ac from the Sacramento Municipal Utility District to 750 volts dc to propel light rail vehicles.

Santa Fe: Will acquire a SPERRY 1100/92 processor, from Sperry Corp., valued at \$9.2 million, for installation at its computer center in Topeka, Kan., in April 1985.

Market Indicators

DRI Railroad Industry Monitor

The contrast between high levels of current activity and weaker signals from indicators of future performance continues to dominate economic news. On the positive side, the 3.3% rise in January retail sales followed by only a small February dip plus the sustained demand for new cars reflect the continued strength in consumer confidence and purchasing power. On the negative side, the decline in stock prices and mixed performance of the dollar against other major currencies reflect the financial community's concern over government failure to reduce the budget deficit.

The DRI Steel Service projects a sharp increase in steel production during the first half of 1984, which will boost rail traffic in iron ore, metallurgical coal, scrap, and primary metals, but weakness in grain traffic is

	1983:4	1984:1	1984:2	1984:3	1984:4	1985:1
Economic Indicators (annualized rates)						
Real GNP (% change)	4.8	6.6	3.4	4.4	4.0	2.6
Industrial production (1967=1.0)	1.56	1.59	1.61	1.63	1.65	1.67
Housing starts (mil. units)	1.69	1.88	1.89	1.84	1.75	1.68
Retail car sales (mil. units)	9.9	10.2	10.3	10.5	10.5	10.6
Raw steel production (mil. tons)	22.2	26.1	27.7	24.5	25.7	28.5
Total Class I Rail Traffic						
(millions of tons)	326.4	319.6	342.1	340.3	341.3	319.7
(billions of ton-miles)	216.6	220.3	220.6	215.4	220.2	221.0
Key Commodities						
Grain	36.2	34.8	30.8	28.0	30.2	30.8
Coal	124.1	118.8	128.9	129.7	136.3	122.1
Pulp & paper	9.2	9.5	9.5	9.3	9.2	9.4
Chemicals	25.5	27.5	26.7	25.9	26.1	27.9
Motor vehicles	5.6	5.6	6.4	4.7	5.7	5.4

Source: Data Resources, Inc., March 15, 1984

likely to offset these gains. Coal traffic is projected to grow steadily during 1984 under the assumption that new contracts will be signed with a minimum of strike-related

production losses, but a lengthy and widespread UMW strike remains a possibility which could dramatically lower coal tonnage.

Revenue freight carloadings

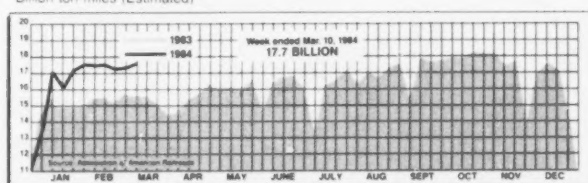
Commodity	Mar. 10 week	% change from 1983	Mar. 3 week	% change from 1983	Feb. 25 week	% change from 1983	Feb. 18 week	% change from 1983
Grain	26,994	(0.9)	26,059	(12.9)	25,036	3.2	29,874	5.3
Other farm products	3,399	12.6	4,031	30.4	4,636	44.7	4,620	52.3
Metallic ores	15,899	43.2	14,394	28.2	15,198	36.0	15,000	39.8
Coal	117,489	18.0	110,312	8.3	117,494	15.4	116,544	16.5
Crushed stone, gravel and sand	9,707	19.5	9,072	16.8	9,379	27.2	8,883	25.7
Nonmetallic minerals	12,291	13.6	10,918	7.0	10,740	25.5	10,921	(0.2)
Grain mill products	11,266	(5.1)	11,429	(3.0)	10,837	(5.8)	11,864	(3.4)
Food and kindred products	10,973	(10.1)	11,264	(10.8)	10,344	(16.7)	11,144	(17.3)
Primary forest products	13,884	(6.1)	13,636	(8.9)	14,616	(2.0)	14,165	(3.6)
Lumber and wood products (except furniture)	7,773	10.0	8,123	18.5	8,024	8.6	7,642	6.5
Pulp, paper and allied products	14,546	(3.7)	15,753	0.1	15,198	(1.2)	14,778	(3.2)
Chemicals and allied products	25,415	1.7	26,869	7.1	25,032	8.5	26,390	13.0
Petroleum products	5,121	10.2	5,050	9.1	4,315	1.6	4,838	12.3
Stone, clay and glass products	10,919	15.6	10,467	15.1	10,844	24.1	10,639	23.8
Coke	5,365	8.4	4,869	5.0	4,833	(2.4)	4,750	2.5
Metals and products	10,459	17.4	11,589	32.4	10,305	26.1	10,437	27.2
Motor vehicles and equipment	22,041	34.2	19,763	22.2	20,810	27.1	20,891	28.5
Waste and scrap materials	10,604	25.3	10,216	26.2	10,837	40.5	11,211	46.7
Forwarder and shipper assn. traffic	7,435	(17.8)	9,258	2.7	10,071	18.3	10,112	7.3
All other carloads	59,876	28.3	57,849	17.4	53,322	15.0	54,248	15.8
LCL traffic	295	13.0	354	60.2	262	28.4	295	75.6
Total Cars Loaded	401,751	13.3	391,275	8.4	392,633	13.3	399,246	13.3
Estimated revenue ton-miles (billions)								
10 weeks	1984 169.2	1983 151.4	% change from 1983 11.7					

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers containers 1984	% increase from 1983
February 11	49,881	3.2	87,759	5.3
February 18	49,533	12.8	87,162	14.6
February 25	48,234	13.7	83,310	22.8
March 3	52,235	20.9	92,115	23.4
Cumulative total, 9 weeks	433,023	15.7	758,907	19.2

Rail freight traffic trends

Billion ton miles (Estimated)



REVENUES AND EXPENSES OF RAILWAYS

Fourth quarter figures of calendar year 1983

(Dollar figures are stated in thousands, i.e., with last three digits omitted)

	Operating revenues				Operating expenses				Income after fixed charges				Net Rly. operating income		Net income	
	Freight	Other	Total	Deprec.	Way & structures	Equipment	Total	Deprec.	1983	1982	1983	1982	1983	1982	1983	1982
Amtrak																
12 mos.	—	175,955	175,955	131,925	95,391	30,069	61,910	85,303	80,715	20,010	398,228	307,815	226,32	233,32	(217,299)	(192,338)
3 mos.	—	685,304	685,304	537,282	208,731	119,492	79,792	349,504	308,411	80,951	1,429,523	1,215,710	208,59	226,27	(797,142)	(762,935)
Atchafalaya & Santa Fe																
12 mos.	533,401	11,364	544,765	488,302	88,026	94,643	3,712	124,075	118,420	23,619	509,665	504,577	93,55	103,33	37,356	(11,384)
3 mos.	2,050,595	40,548	2,091,143	2,077,660	333,861	319,647	15,311	487,236	483,938	94,578	1,961,849	1,996,322	93,81	96,08	120,019	63,499
Baltimore & Ohio																
12 mos.	894,787	32,804	927,591	899,937	217,631	205,779	8,165	218,661	207,803	28,800	935,865	928,071	101,88	103,23	(3,597)	(28,304)
3 mos.	11,188	4,517	15,705	17,579	3,006	4,663	987	1,044	2,909	1,128	12,996	17,288	82,75	98,34	2,522	1,366
12 mos.	49,849	14,318	64,167	82,059	12,727	15,565	3,953	7,186	12,576	4,592	58,007	80,769	90,40	98,42	6,631	5,075
Boston & Maine																
12 mos.	30,113	1,480	31,593	28,647	5,477	6,618	365	7,723	9,228	356	29,266	32,847	92,69	114,66	2,855	(3,573)
3 mos.	113,093	5,180	118,273	120,053	22,579	25,274	1,455	33,841	34,729	1,439	120,503	126,482	101,88	105,35	(713)	(1,925)
Burlington Northern																
12 mos.	1,017,796	23,257	1,041,053	975,472	171,428	189,641	6,571	193,738	192,809	17,753	882,033	854,396	84,72	87,60	164,986	100,536
3 mos.	3,931,248	37,802	4,019,050	3,767,163	787,153	794,365	24,286	724,912	769,923	70,272	3,479,711	3,526,207	86,58	93,60	520,150	235,288
Chesapeake & Ohio																
12 mos.	911,767	37,470	949,237	1,041,113	192,645	207,586	7,861	209,088	216,512	13,668	876,912	940,018	92,38	90,28	71,823	158,290
3 mos.	232,887	10,420	243,307	241,378	42,195	41,621	1,967	53,842	48,739	3,126	222,520	220,450	91,45	91,32	34,196	35,458
Chicago & North Western																
12 mos.	193,374	27,808	221,182	197,542	49,327	37,578	1,901	51,442	45,638	2,537	220,743	196,364	98,80	99,40	(1,212)	(4,404)
3 mos.	756,234	105,341	861,575	807,860	170,888	170,075	6,677	203,178	199,451	16,107	832,757	830,219	96,65	102,76	9,491	(27,335)
Chicago, Milwaukee, St. Paul & Pac.																
12 mos.	89,440	3,027	92,467	79,592	14,426	18,931	707	29,882	23,286	3,344	93,347	87,112	100,95	109,44	1,623	(3,228)
3 mos.	346,013	16,920	362,933	363,549	67,178	86,428	2,897	105,557	105,754	13,369	368,563	402,489	101,55	110,71	(20,555)	(436)
Conrail																
12 mos.	764,396	28,714	793,110	808,988	154,790	181,187	7,115	207,840	216,548	50,863	746,015	844,782	93,99	104,42	56,611	(40,474)
3 mos.	2,916,294	109,016	3,025,310	3,440,472	602,894	760,523	28,141	756,541	898,606	159,986	2,894,316	3,565,286	95,67	103,62	130,072	(133,144)
Delaware & Hudson																
12 mos.	26,837	491	27,328	25,422	4,938	7,013	157	8,714	8,092	860	29,440	30,364	107,72	119,43	(4,406)	(7,291)
3 mos.	105,427	2,927	108,354	110,573	19,974	26,304	635	32,337	30,557	3,480	114,295	121,936	105,48	110,27	(16,317)	(20,231)
D / & Rio Grande Western																
12 mos.	300,701	5,700	306,401	292,463	53,087	48,989	2,899	63,185	54,421	12,347	291,740	266,206	95,21	91,02	12,206	24,544
3 mos.	1,247	80,313	81,560	67,028	16,665	10,682	764	15,378	12,821	3,038	77,912	60,793	97,01	90,69	1,334	5,660
Delaware, Toledo & Ironton																
12 mos.	20,431	722	21,153	16,017	3,708	2,780	1,680	6,830	6,226	781	21,958	20,191	103,80	126,05	(1,305)	(4,951)
3 mos.	66,406	2,548	68,954	68,272	10,206	14,007	2,024	21,763	24,881	3,438	74,073	82,827	107,42	121,31	(8,492)	(16,459)
Duluth, Missabe & Iron Range																
12 mos.	21,554	319	21,873	9,029	7,976	5,636	1,158	2,358	1,978	716	19,244	15,736	87,98	174,28	5,300	(6,138)
3 mos.	76,052	2,088	78,140	54,320	25,229	23,049	4,090	8,867	9,483	2,855	66,501	67,160	85,10	123,63	15,678	(9,060)
Elgin, Joliet & Eastern																
12 mos.	14,981	8,101	23,082	19,933	3,038	2,617	198	2,761	2,743	1,861	19,102	18,195	82,82	91,28	4,435	2,483
3 mos.	58,137	32,708	90,845	89,180	12,784	13,600	789	11,268	9,312	7,507	81,424	79,562	89,82	89,21	12,218	13,728
Florida East Coast																
12 mos.	29,369	393	29,762	25,162	6,190	5,017	331	4,953	4,078	1,099	23,031	20,772	77,38	82,55	16,913	6,726
3 mos.	103,451	1,325	104,776	91,785	21,859	21,684	1,314	16,907	13,862	4,389	84,075	79,428	80,24	86,53	67,835	20,079
Grand Trunk Western																
12 mos.	59,330	2,265	61,595	49,564	9,013	7,670	4,077	15,328	15,857	1,230	65,841	61,328	106,89	123,73	(5,936)	(13,203)
3 mos.	215,440	11,828	227,268	235,753	31,564	34,451	5,567	52,559	56,236	4,987	238,612	245,841	104,99	104,27	(16,068)	(13,586)
Illinois Central Gulf																
12 mos.	199,397	18,116	217,513	212,416	22,893	39,701	1,992	69,039	56,605	10,968	212,809	220,636	97,83	103,96	3,084	(11,434)
3 mos.	799,635	74,532	874,167	895,862	112,045	193,893	7,889	273,334	269,861	37,858	865,768	984,104	99,03	109,84	(14,264)	(82,326)

Kansas City Southern	3 mo.	70,758	3,187	73,945	70,569	10,508	15,430	744	20,200	16,445	7,353	85,888	66,365	88.80	94.04	3,955	253	5,727	1,400	827
Missouri-Kansas-Texas	12 mos.	293,125	12,915	306,040	307,599	51,954	83,051	3,094	75,019	66,686	22,973	271,443	274,761	88.69	89.33	25,834	20,729	24,557	19,099	16,026
DATA NOT AVAILABLE AT PRESS TIME																				
Missouri-Pacific	3 mo.	403,864	10,882	414,746	378,157	74,519	82,109	3,005	96,168	89,022	17,642	383,060	359,030	92.36	94.64	23,752	10,191	27,046	16,704	13,291
Norfolk & Western	12 mos.	1,611,212	40,324	1,652,036	1,678,764	290,900	282,694	11,271	378,976	393,758	71,708	1,506,981	1,508,612	91.21	89.86	97,211	140,859	124,776	87,048	108,450
Pittsburgh & Lake Erie	3 mo.	392,675	14,923	407,598	342,489	75,550	80,965	4,059	68,577	69,887	9,030	326,189	334,812	80.02	87.53	103,853	82,453	47,090	61,662	53,018
St. Louis Southwestern	12 mos.	1,468,915	57,704	1,526,709	1,737,296	330,286	349,168	15,765	273,553	299,906	51,751	1,326,314	1,420,624	86.87	81.77	292,503	443,225	124,070	185,719	273,497
Seaboard System	3 mo.	12,775	404	13,179	9,728	1,475	1,814	831	4,902	2,380	360	14,401	12,802	109.27	131.59	(4,521)	(3,552)	(1,216)	(4,522)	(3,140)
Soo Line	12 mos.	41,618	1,583	43,201	47,216	6,272	9,214	973	19,110	13,073	1,432	57,840	60,553	133.86	128.24	(25,070)	(16,291)	(12,598)	(23,066)	(16,080)
Southern	3 mo.	95,040	1,272	96,312	76,123	18,176	8,380	743	22,048	17,839	5,638	92,429	67,853	95.96	89.13	14,138	10,512	(5,137)	5,118	7,269
Southern Pacific	12 mos.	362,271	5,490	367,761	340,973	57,172	47,910	2,812	89,706	76,432	22,917	343,681	299,874	93.45	87.94	39,215	47,152	7,036	22,171	33,954
Union Pacific	3 mo.	639,401	13,392	652,793	569,363	113,681	103,793	5,137	161,691	150,437	19,984	600,191	561,314	91.94	98.56	52,941	144,208	33,449	30,796	156,270
Western Pacific	12 mos.	2,419,558	52,357	2,471,915	2,595,645	427,148	437,024	20,391	631,729	609,167	78,825	2,322,441	2,324,383	93.95	97.01	124,978	202,012	133,669	98,071	222,854
	3 mo.	75,731	2,634	78,365	67,679	13,605	12,150	497	18,017	15,755	2,033	69,684	63,314	88.92	93.55	9,511	4,537	5,256	5,875	2,412
	12 mos.	285,757	7,473	293,230	284,193	60,496	58,774	1,940	66,438	62,260	8,119	274,054	263,501	93.46	92.71	20,672	24,441	12,264	12,931	15,293
	3 mo.	383,745	9,400	403,205	394,026	53,992	61,156	6,127	83,787	75,270	14,178	332,680	334,610	82.50	87.13	69,707	49,313	41,742	39,459	30,483
	12 mos.	1,567,502	35,293	1,602,795	1,603,597	249,887	250,881	21,951	325,620	322,942	73,645	1,358,293	1,381,955	84.74	86.17	230,118	223,724	158,005	136,228	143,690
	3 mo.	485,219	16,338	501,557	444,978	117,448	66,111	4,807	141,925	130,307	21,303	568,674	482,567	113.38	108.44	(63,140)	11,869	(29,371)	(25,394)	7,831
	12 mos.	1,906,853	56,936	1,963,789	1,996,063	396,456	313,620	19,449	553,703	579,905	85,364	2,125,347	2,089,490	108.22	104.68	(138,672)	387	(66,302)	(43,416)	8,149
	3 mo.	473,164	5,562	478,756	412,334	82,462	60,199	3,485	96,932	95,086	23,671	411,927	386,015	86.04	93.81	81,553	21,613	40,843	35,547	26,100
	12 mos.	1,784,483	24,828	1,809,311	1,773,337	284,822	266,668	13,889	370,328	377,413	95,453	1,602,010	1,604,369	88.54	90.47	184,263	146,602	131,956	116,760	105,028
	3 mo.	31,516	593	32,109	37,652	8,951	7,333	182	9,964	9,648	1,712	43,474	43,993	135.39	116.84	(11,731)	(4,906)	(3,881)	(4,241)	(3,456)
	12 mos.	145,475	1,867	147,362	171,797	27,424	29,100	627	40,727	40,585	7,012	175,915	183,117	119.37	106.58	(26,559)	(7,105)	(12,217)	(10,306)	(4,050)

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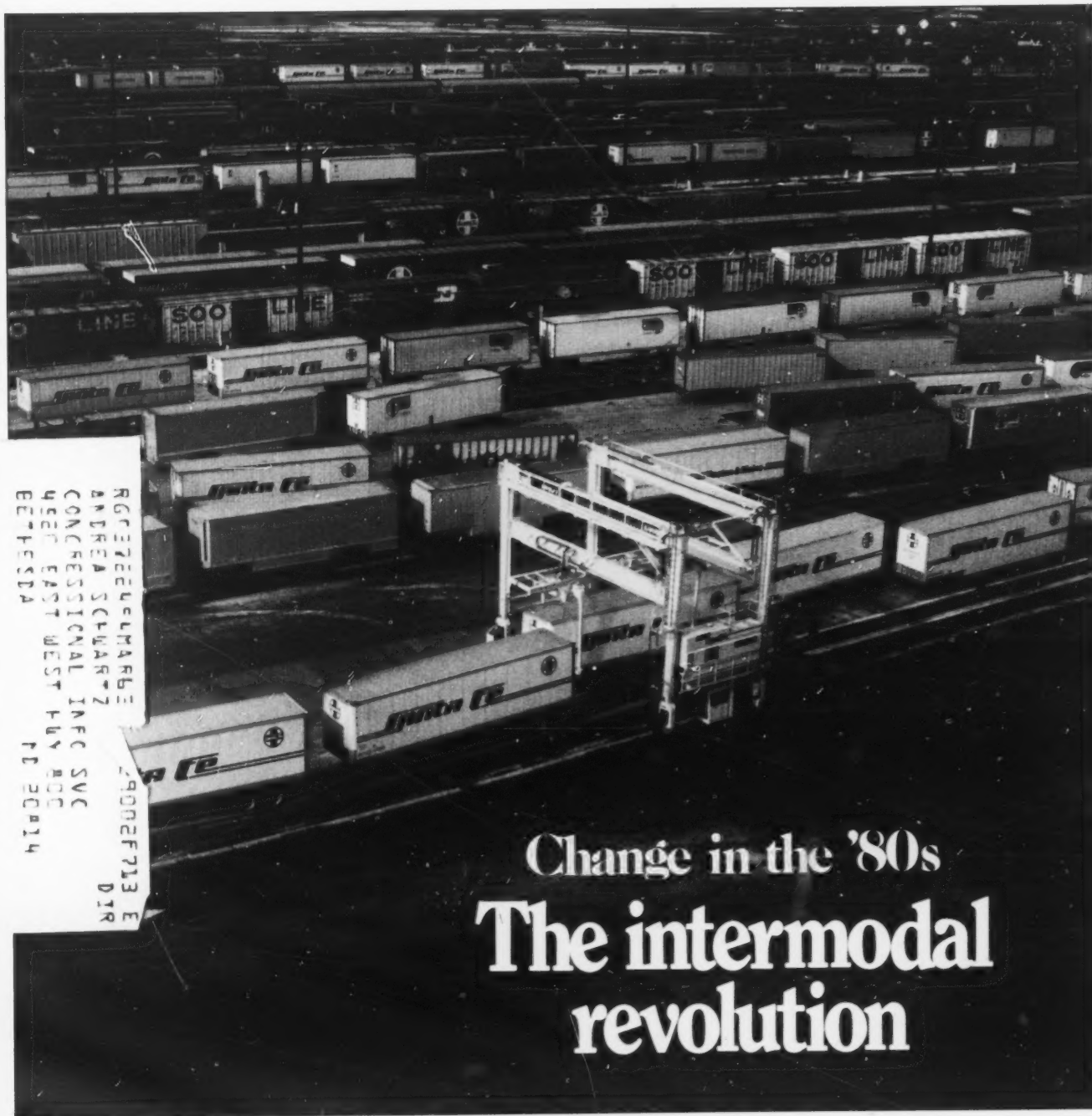
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May 1984

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DART: A Texas-size
rail transit system

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Change in the '80s
**The intermodal
revolution**

RAILWAY AGE

...for the new age of railways



Cover: Photo by Santa Fe System Photographer Orville Brent, Jr. *Page 35.*



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Features

35 **Change: The intermodal revolution**

Piggyback for profit (and the operative word is "profit") is the railroads' goal as they seek to capture market share from the motor carriers.

41 **Coal cars: The lightweight race**

Some are in service, some are still in prototype. All will deliver more payload per pound of car. But so far, the market has been slow to develop.

46 **Track machines that work harder, faster**

Railroads want more-reliable, easier-to-maintain machines that take up minimal track time—and builders are not walking away from the challenge.

57 **CN's C&S goal: Full control**

In the West, in particular, CN is turning to communications and signaling to wrest additional productivity from an already-strained track structure.

64 **Old-line supplier goes high-tech**

Octogenarian Vapor Corp., once known as a supplier of steam heating systems, has advanced rapidly—and successfully—into the electronics age.

69 **DART: Texas-size rail transit**

With 160 miles approved, Dallas has the biggest rail plan of them all; transit vendors around the world are sitting up and taking notice.

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Inside

Supply-side railroading

If you ever had any doubts as to the interdependence of the railroads and their suppliers, several stories in this issue should dispel them. That interdependence is, in fact, so strong that it is almost impossible to write about one without writing about the other.

Our cover story—"Change: The intermodal revolution" (p. 35)—addresses what is perhaps the single most urgent issue confronting the railroads: the need, in an economy that is shifting from smokestack to high-tech, to capture market share from the highways. *If a dozen carbuilders (and many more component suppliers) had not in recent years been investing millions of R&D dollars in new and cost-effective intermodal equipment, this story could not have been written.*

The m w story that starts on p. 46 describes technology that is permitting the railroads to haul more tonnage over less track; *it could not have been written if the track-machine builders had not plowed millions of R&D dollars into equipment that works faster and takes up less train time.*

"Coal cars: The lightweight race" (p. 41) describes efforts to increase the payload of the rolling stock that carries the railroads' single biggest commodity; *it could not have been written if half a dozen carbuilders had not invested millions of R&D dollars in prototypes* (an investment they made when many thousands of coal cars were sidelined for lack of business, and the market for new cars did not look all that good).

And then there's the news story on p. 22, about the AAR summoning suppliers to an April 3 meeting in Chicago to ask them to come up with designs for an "integral" train. (As one supplier remarked, with a mixture of gloom and satisfaction, "When the railroads need something done, they turn to us old-liners.")

All of this talk about "interdependence" might seem to be an exercise in making the obvious less obscure. But the obvious is not always that obvious. It wasn't obvious to the rail-transit industry, which drove such hard bargains with its suppliers and imposed such demands on them that, one by one, many of them were driven out of the business—with the result that today the rail-transit industry has to do much of its shopping overseas.

Freight railroad people, of course, are smarter than that. Aren't they?



LUTHER S. MILLER

Market Outlook

Equipment

American Maize Products Co.: Is leasing 60 17,600-gallon tank cars from Union Tank Car for haulage of high fructose corn syrup. The cars will have Lithcote food-grade interior linings.

Facilities

Amtrak: Will spend \$1.14 million on additional improvements to its maintenance facility at Beech Grove, Ind., including purchase of a new wheel boring and hub facing machine and replacement of the Magna-Flux machine used for detecting axle defects. Amtrak has also placed a \$1-million order with CalComp of Anaheim, Calif., for two IGS 500 computer-aided design (CAD) systems to be used in various electrical, mechanical, structural, and civil engineering projects.

Conrail: 1984 capital budget of \$520 million includes \$250 million for track, \$100 million for additions and improvements, and \$170 million for equipment (see p. 24).

CSX: Track improvement programs for the Seaboard and Chessie System railroads add up to \$328 million for 1984. Seaboard's program calls for laying of 560 miles of cwr, insertion of 1.9 million ties, and surfacing of 7,400 miles of track. Chessie will lay 453 miles of cwr, insert 2 million ties, and surface 5,000 miles.

Saudi Railways Organization: Ordered 10 SDL50 six-axle, 3,500-hp diesel-electric locomotives, valued at \$12 million, from the Electro-Motive Division of General Motors. EMD delivered six SDL50 units to Saudi Railways in 1982.

Washington Metropolitan Area Transit Authority: A \$32.4-million grant from the Urban Mass Transportation Administration includes \$13.9 million for Metrorail car reliability and rail improvements and \$18.5 million for operating assistance.

Freight cars and locomotives

	DELIVERED		February 1984	Three Months	
	1984	1983		1984	1983
Built new by carbuilders	894	334	528	1,837	1,185
Built new in RR shops	0	110	0	0	200
Built new—total	894	444	528	1,837	1,385
Rebuilt	0	0	0	0	0
TOTAL DELIVERED	894	444	528	1,837	1,385
Locomotives (new and rebuilt)					

	ORDERED				
To be built new by carbuilders	1,213	207	1,523	5,472	1,005
To be built new in RR shops	0	0	0	0	2
To be built new—total	1,213	207	1,523	5,472	1,007
To be rebuilt	0	0	0	0	0
TOTAL ORDERED	1,213	207	1,523	5,472	1,007

	ON ORDER AND UNDELIVERED		March 1 1984	Average Backlog	
	1984	1983		1984	1983
To be built new by carbuilders	6,928	3,914	6,548	6,375	4,037
To be built new in RR shops	0	2	0	0	86
To be built new—total	6,928	3,916	6,548	6,375	4,123
To be rebuilt	0	0	0	0	0
TOTAL ON ORDER	6,928	3,916	6,548	6,375	4,123
Locomotives (new and rebuilt)					

Source: Transportation Division, AAR
*Locomotive figures unavailable at press time

Estimated ownership—all revenue freight cars

March 1, 1984 vs. March 1, 1983

		Box	Covered Hoppers	Gondola	Hopper	Flat	Refg.	All Others	TOTAL
Class I RRs	1984	267,774	163,863	128,967	281,583	84,116	52,945	21,767	1,001,015
	1983	277,994	165,220	133,979	291,991	85,364	55,797	23,083	1,033,428
Class II & S&T Cos.	1984	47,107	9,547	10,221	10,767	4,811	3,166	3,053	88,672
	1983	48,934	9,638	10,344	11,134	4,136	3,354	2,912	90,452
Railbox-Railgon	1984	15,082		3,998					19,080
	1983	21,401		3,998					25,399
RRD&C** Refgs.	1984						5,790		5,790
	1983						4,415		4,415
Private	1984	545	128,377	27,797	21,653	53,765	1,314	184,545	417,996
	1983	407	130,444	27,798	21,172	54,100	3,244	186,525	423,690
GRAND TOTAL	1984	330,508	301,787	170,983	314,003	142,692	63,215	209,365	1,532,553
	1983	348,736	305,302	176,119	324,297	143,600	66,810	212,520	1,577,384

*Class II railroads and switching terminal companies.

**Railroad owned and controlled refrigerator car lines.

Source: Transportation Division, AAR.

Market Indicators

DRI Railroad Industry Monitor

The very strong growth that lifted the economy out of the recession is now giving way to more moderate expansion. The increase in GNP is forecast to slow to a 2.8% rate by the end of the year, compared to a 7.3% rate in the first quarter. DRI expects retail auto sales to level off at a 10.6 million rate for the remainder of the year, and interest rate pressures should push housing starts back down to a 1.7- or 1.8-million-unit rate for the second half. The slowdown in growth should help keep the economy from overheating this year and sliding into a recession in 1985, but it means that the battle for transportation market share will grow more intense as carriers seek to maintain their growth rates.

The economic and rail traffic forecasts represent the most likely path for the economy to take, but the growing potential for labor unrest is increasing uncertainty about the second half of the year. Coal traffic has already risen sharply as some utilities are

	1983:4	1984:1	1984:2	1984:3	1984:4	1985:1
Economic Indicators (annualized rates)						
Real GNP (% change)	5.0	7.3	4.0	4.1	2.8	2.3
Industrial production (1967 = 1.0)	1.55	1.60	1.62	1.64	1.65	1.67
Housing starts (mil. units)	1.70	2.01	1.90	1.84	1.74	1.67
Retail car sales (mil. units)	9.9	10.5	10.6	10.6	10.6	10.6
Raw steel production (mil. tons)	22.2	26.1	27.7	24.5	25.7	28.5
Total Class I Rail Traffic						
(millions of tons)	326.4	338.4	339.1	337.0	338.9	324.8
(billions of ton-miles)	216.6	223.0	220.5	215.9	221.2	225.5
Key Commodities						
Grain	36.2	36.2	30.9	28.2	30.8	32.1
Coal	124.1	133.4	129.7	130.6	137.7	130.2
Pulp & paper	9.2	9.3	9.4	9.1	9.0	9.2
Chemicals	25.5	27.3	26.7	26.0	26.1	27.9
Motor vehicles	5.6	6.1	6.4	4.8	5.7	5.4

Source: Data Resources, Inc., April 17, 1984

building stockpiles in anticipation of a UMW strike. The recent announcement of large auto executive bonuses plus the vulnerability of the auto industry to a strike raises the likelihood of a walkout. Finally, the opening bargaining position of rail labor

indicates that rail management may face a difficult choice this year: take a strike and incur sizeable short-term financial losses or give labor a settlement which will make it impossible for railroads to compete with trucks in a growing number of markets.

Revenue freight carloadings

Commodity	Apr. 7 week	% change from 1983	Mar. 31 week	% change from 1983	Mar. 24 week	% change from 1983	Mar. 17 week	% change from 1984
Grain	29,414	38.5	28,422	39.2	27,265	15.1	29,590	12.2
Other farm products	4,281	58.6	3,447	13.6	3,429	9.9	3,343	(3.0)
Metallic ores	15,210	5.8	18,203	54.4	16,666	39.0	17,100	42.1
Coal	113,236	17.8	121,171	41.1	118,000	25.4	121,223	22.1
Crushed stone, gravel and sand	10,783	19.3	9,898	26.1	10,270	23.8	9,682	16.7
Nonmetallic minerals	11,243	4.2	12,703	37.4	12,388	17.9	11,903	(0.2)
Grain mill products	10,368	(1.4)	11,326	4.8	11,038	(4.8)	11,467	(0.1)
Food and kindred products	10,819	(9.2)	11,536	3.6	10,948	(8.7)	10,720	(8.8)
Primary forest products	13,962	(0.7)	13,996	(3.6)	14,399	1.1	14,517	(2.7)
Lumber and wood products (except furniture)	7,523	15.5	8,599	23.0	8,048	7.0	7,835	7.1
Pulp, paper and allied products	15,180	3.5	15,948	2.7	14,916	(3.3)	14,893	(3.3)
Chemicals and allied products	24,812	10.2	26,836	18.1	25,948	9.5	26,069	10.5
Petroleum products	5,180	18.3	4,526	17.5	4,550	9.7	5,028	11.5
Stone, clay and glass products	11,263	18.9	11,125	18.7	11,074	19.3	11,059	15.3
Coke	5,636	21.0	5,369	26.1	5,677	9.6	5,239	7.5
Metals and products	10,911	26.7	11,330	24.3	10,827	19.2	10,496	17.1
Motor vehicles and equipment	21,297	39.7	21,795	43.4	21,208	28.1	21,406	28.1
Waste and scrap materials	10,069	30.0	10,902	48.5	10,519	29.2	10,664	25.8
Forwarder and shipper assn. traffic	8,035	0.3	7,509	(13.4)	7,637	(13.4)	7,394	(16.1)
All other carloads	60,350	36.5	61,993	30.9	59,193	22.2	59,735	26.8
LCL traffic	272	33.3	301	42.7	285	25.0	253	(0.8)
Total Cars Loaded	399,844	18.7	416,935	28.2	404,285	16.8	409,616	15.2

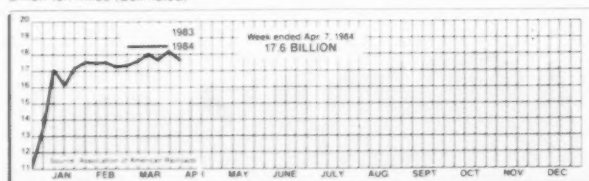
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
14 weeks	240.7	210.6	14.3

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers containers 1984	% increase from 1983
March 10	51,189	19.0	89,347	20.3
March 17	52,415	21.8	92,303	25.6
March 24	51,964	18.8	91,234	22.3
March 31	55,201	29.7	93,296	26.2
Cumulative total, 13 weeks	643,792	18.2	1,125,126	20.3

Rail freight traffic trends

Billion ton miles (Estimated)



Roy Blanchard

The intermodal revolution

The message is clear: If railroads are to grow, they have to win traffic from the highways. The big question now is: Can they do so at a profit? The signs look promising.

By GUS WELTY,
Senior Editor

With the U.S. economy likely to be going through a stage of low and selective growth, the railroads' best hope for growth—for the rest of the 1980s and perhaps for the rest of the 20th century and beyond—lies in increasing market share.

And the best hope for increasing market share lies in increasing intermodal business—on, of course, a profitable basis.

A number of signs indicate that the industry will be able to turn this hope into reality.

For one thing, most if not all major intermodal operators are abandoning the counter-productive approach of trying to maintain a piggyback ramp at every location on the system where there may be a few trailers to be had. The efficient, high-volume, mechanized hub center is being recognized as the way to go, and it's the way most roads are going.

For another, the industry as a whole seems finally to be getting a firm grip on development of equipment for the next phase of intermodal operation. Not so awfully long ago, there were concerns that the industry was drifting away from some of the things that made piggyback work so well in the first place—such things as standardization and interchangeability and pooling in the areas of equipment design and fleet management. Now, however, a consensus seems to have been rebuilt, that despite

the mergers that have created mega-railroads and despite the changes that are taking place in the makeup of the highway trailer fleet, those old qualities still are and will continue to be valuable ones to have around.

In addition, while individual railroads are going about the marketing of TOFC/COFC services in widely varying ways, there are successes being recorded from both basic approaches, wholesaling and retailing of intermodal.

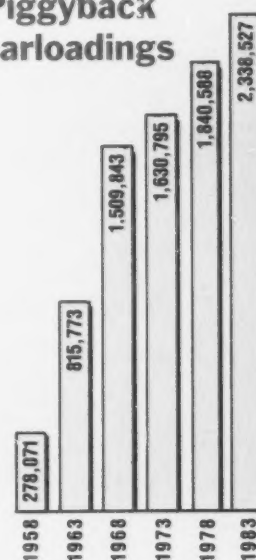
But, as might be expected, not all the signs are positive.

For example, since its deregulation, the motor-carrier industry has been ever more fiercely competitive. The proliferation of owner-operators, the creation of non-union carriers, and the granting of wage-and-rule concessions by the Teamsters to unionized operations have all contributed to downward pressure on rates and to overcapacity in the trucking industry.

For example, despite the efficiencies made possible by the streamlining of terminal operations and through the use of new, lighter-weight and more fuel-efficient railcar equipment, railroads still are having a tough time staying competitive in the mileage ranges where high volumes of highway traffic could and should be available for rail movement via piggyback.

For example, with the makeup of the highway trailer fleet changing and with more change likely to come, Trailer Train, the railroads and the car-

**Piggyback
carloadings**



Change



Well-designed and mechanized terminals are the key to keeping trailer/container handling costs down and service up.

builders are being pressed to cope with what's happening, while they're also being asked to predict what further changes will be coming along during the life of the railcar equipment being designed, built and bought.

And, for example, there is long-standing and continuing concern about margins, about profitability. Given the facts of competitive life as they exist and as they are likely to continue to exist, it would appear that profitability improvement will have to come in large part on the cost side and not on the rate side. Better cost control, of course, means many things—but of vital importance will be better control of labor costs. This means that rail labor, too, will have to become a believer in intermodal as the best hope for the future.

The challenges are daunting, but the stakes are high—and the game is one that the railroad industry cannot afford to lose, especially in view of the pessimistic forecasts that are being made regarding available traffic volume in markets that have traditionally been strongly rail-oriented.

Internally, what intermodal comes down to are matters of controlling costs more effectively and of more effectively marketing what is already, for the most part, an excellent service.

Consider first, the marketing aspects. In few areas of railroading are there more pronounced philosophical differences than in the approach to intermodal marketing—with some roads strongly for wholesaling, some strongly for retailing and some hedging bets by trying for a blend of the two.

Consider the approaches that have been taken by Santa Fe and Chessie System.

Santa Fe has aimed its marketing strategies at

being a wholesaler providing an efficient and cost-effective ramp-to-ramp service. Business has grown, to more than 705,000 trailers/containers handled last year, which was upwards of 30% of all trailers/containers loaded by western carriers. Intermodal traffic generated about one third of Santa Fe's total 1983 freight revenues. And the volume of traffic being generated by third-party accounts also continued to grow, to almost 90% of the total.

This hasn't happened by accident. As Vice President-Traffic Thomas J. Fitzgerald notes, early in the development of piggyback, Santa Fe saw intermodal as a flexible and cost-effective service. Santa Fe also recognized, Tom Fitzgerald says, "many of the obstacles and pitfalls in marketing and operating intermodal services which had to be overcome if intermodal would in fact fulfill the industry's needs and our own expectations."

Santa Fe, he says, "quickly became aware that we had to market intermodal as a unique element in the transportation service market and not merely as an add-on to existing rail operating and marketing programs. Intermodal by definition draws from many disciplines and goes well beyond the scope of everyday rail operations. To develop effective intermodal programs, we had to determine how to adapt the inherent marketing and operating advantages of the rail and truck modes to bring about the greatest efficiencies of each."

On the operating side, Santa Fe concentrated on providing the equipment that would be needed, on mechanizing its major terminals, and on building a fleet of high-speed, dedicated intermodal trains in its major traffic corridors. All of this represented, Fitzgerald says, concentration "on areas in which we felt we could provide the most expertise."

On the marketing side, Santa Fe concentrated on wholesaling. And what advantages did it see third parties bringing to the table? "First, in the aggregate, broader geographic and customer coverage by an aggressive sales force. Second, the ability to put together transportation packages involving multiple rail carriers that, absent a mediating force, might find coordination difficult. Third, assumption by the third party of responsibility for handling customer service with beneficial owners, including tracing, claims and billing, all areas where the third party is the inherent low-cost producer. Fourth, the ability to arrange drayage with a multitude of independent owner-operators, who are customarily the low-cost producers of these services. When you add it all up," Tom Fitzgerald concludes, "we see a valuable and continuing role for third parties in this growth end of our business."

If there is a philosophical spectrum to the marketing of intermodal services—and there is—Santa Fe is positioned at one end, Chessie System at the other.

Chessie has no quarrel with the development of services involving third parties. But, as Chessie Motor Express President Leonard C. Schaffel has pointed out, the brunt of the trans-



With volume and revenue growth in every quarter since it was set up, CMX gives the CSX roads a strong retail presence.

portation obligation lies with the railroad: "It's the investment in locomotives, flatcars, trailers and ramp facilities that makes intermodal services a reality. The railroad has not only a right to package its product in the best possible manner but also a responsibility to the public to protect an innovative and economical method of transportation. That protection can and should be a mixture of services provided to third parties to fill a need and a direct exposure to the public to offer similar services on a one-on-one basis."

So, Chessie gave birth to Chessie Motor Express late in 1980, and CMX has shown steady growth, quarter by quarter, without an exception, ever since.

In its first full quarter, January-March 1981, CMX handled fewer than 1,900 trailers, and its revenues came in at under \$300,000. But in the fourth quarter of 1983, CMX handled 38,658 truckloads, and its revenues were \$10,886,000. For the full year, CMX handled 130,910 units, an increase of 108% from 1982, while its 12-month '83 revenues were up by \$18.1 million, to \$33.4 million.

In the CMX view, exemption from regulation for piggyback traffic gave railroads the opportunity "to vigorously enter the marketplace and enlarge their share of this type of traffic." But, in that same view, some railroads waited instead for the marketplace to come to them, "and the marketplace certainly did come, dominated by third-party entrepreneurs." The entrepreneurs asked for lower wholesale rates in order to increase their share of the retail market, and when railroads agreed they "not only lowered their profit margin, they slowly but very surely enabled certain retailers to corral a large segment of the market."

What CMX's Schaffel saw coming, months ago, was a situation in which lack of profit could lead to cutbacks in schedules and in capital expenditures for equipment and ramps, as well as attempts to improve the profit situation by increasing rates. With such trends, "we could see an erosion of traffic back to the highways. The loyalty of the third-party entrepreneurs will be severely tested. They will be tempted to negotiate with over-the-road carriers to perform services previously provided by railroads."

Even before the piggyback exemption was granted, Schaffel recalled, Chessie determined that "a complete, door-to-door, one-carrier-responsibility form of transportation was necessary in order to capture the interest of the sophisticated shipping community. Chessie realized that by developing their own sales base and direct shipper



New-generation equipment is shaking down to basic designs for articulated and single-platform cars, plus well cars for container-stacking.

relationships they could create shipper loyalty and offer shippers economy without erosion of the lifeblood of any viable business enterprise—profit."

But, across the philosophical spectrum, there remains that nagging matter of profit.

Tom Fitzgerald at Santa Fe says that "the question of profitability continues to be a problem." CSX says that "profit levels on intermodal traffic remained marginal in 1983, reflecting a highly competitive environment and the excess capacity of the various transportation modes."

However they approach the marketing of intermodal, one hope for the railroads is that price levels in the motor-carrier area will firm up and even go up, as truckers try to make up for the losses experienced over the past several years.

Motor-carrier pricing, however, is likely to remain a mixed bag, and there is no guarantee that rates will rise to a point where railroads can safely try to improve profitability by concentrating on the pricing side of the equation.

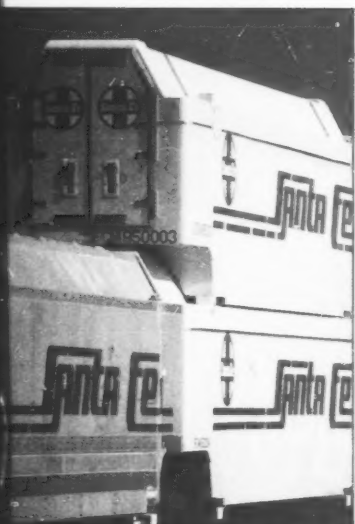
Railroads, meanwhile, are faced with definite problems in cost reduction, especially if the opportunities for rate increases are limited. And the numbers have not been running in the railroads' favor, not for years and not now.

The railroad share of market as compared with the truck share, for example, has been dropping, before and since deregulation. By one estimate, the rail share of movement of manufactured goods fell from more than 37% two decades ago to well under 20% in the most recent year for which hard numbers are available. In the past decade, the motor carriers' share of intercity-transportation dollars has risen slightly, while the

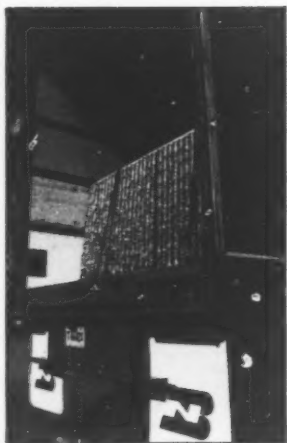


As intermodal volume grows, so does the need for greater efficiency in scheduling, dispatching, and handling the records.

Change



With fiberglass and aluminum prototypes available for testing, Santa Fe has high hopes for its double stack container system.



Improvements in trailer design, among them use of floor-mounted anchor rails, will open up intermodal to more commodities.

rail share has gone down rather more sharply. No matter who's doing the measuring, for whatever period in recent history, the railroads have suffered and the truckers have benefitted. Rail labor should have an interest in these market-share numbers. But rail labor should have an even bigger interest in how the numbers have translated so far as jobs are concerned: Twenty-five years ago, employment in the two industries was about even—but as of the middle of last year, employment in the trucking industry was three times what it was in the railroad industry.

Add to this the studies developed by such roads as Burlington Northern, and it becomes clear that railroads are going nowhere in TOFC COFC unless and until they can bring costs under control.

What the BN study indicated was, first, that 700 miles was about the break-point so far as its intermodal competitiveness is concerned. Second, the study showed that the break-point could be reduced significantly, through use of more efficient railcar equipment, through completion of its hub-center terminal-modernization program, and through elimination of empty backhauls. Dropping the break-even point by 150 miles or so, BN found, would open up a lot more over-the-highway business for conversion to piggyback.

What the BN study also found was that increases of the magnitude of those included in the current labor agreements would negate all the gains in operating, terminal and equipment improvements that might be made. And in their demands in the new round of negotiations the unions—first the operating organizations and now the non-ops—are asking for far more than the wage-benefit increases under the current agreement which was negotiated several years ago. At the same time, the organizations show little or no inclination to relax things in terms of work rules.

To these economic factors has to be added the fact that motor carriers are going to be increasing their own efficiency. They have the concessions made by their major union. They have the research-and-development efforts being made by highway-tractor and -trailer manufacturers to do what railroad suppliers are doing, namely to increase the efficiency of the equipment. They have governmental agencies providing and maintaining their right-of-way, and they have the new benefits of being able to operate longer, wider and heavier rigs, as well as double-bottoms, on major highways without having to worry about state-imposed restrictions. Truckers will be paying more in taxes for the privilege. But few observers think that the in-

crease in payments will come near to offsetting the economic benefits that have been granted.

While all of this has been going on, Trailer Train has been plugging away, trying to develop the next generation of intermodal cars and trying, at the same time, to work out the economic arrangements that will make provision of cars by TT attractive from both a technological and an economic standpoint. At this point, Trailer Train appears to be succeeding on both counts.

If there is an equipment question, it has to do with what government has already permitted in terms of trailer sizes, and in terms of what government might permit next. For example, the numbers show that the number of long trailers is steadily increasing. Just seven years ago, the number of trailers which could be called "short" represented 78% of the fleet, with just 22% of trailers measuring in at 45 feet or more. But for 1982, the percentage of short trailers had dropped sharply, and the number of 45-foot units had climbed to 40%. Figures for '83, when they're available, will no doubt show another increase in the 45-foot-and-longer units and another drop in the 40-foot-and-under fleet, relieved only by a new interest in 28-foot pups for use in double-bottom operations.

So, intermodal is changing. No area of railroading, probably, is changing so rapidly. No area of railroading may be so important, tomorrow and the day after. And so in no area of railroading will action, reaction, be so important.

And right now, there are a lot of things that are going to matter, if railroads are going to turn the hopes into reality.

The first is that TOFC COFC has to be moved out of the marginally-profitable realm into an area where top management can really be committed to improvement in facilities, equipment and service.

Look at it this way: The economy is turning from producing to service. Producers are having to handle smaller inventories, and to put smaller inventories into the hands of their customers. Shippers and receivers want better service, with smaller-lot shipments. Consumers, at the end of the line, are demanding lower costs, lower prices.

Railroads will move the goods demanded for the economies of the 1980s and the 1990s if they do it intermodal-style. But those goods won't move by rail unless the price is right.

The service now is good, and it will continue to be. It's rail management's job—and rail labor's—to make sure that the price is as good as the service.

Otherwise, intermodal's future isn't there. ■

NOTE

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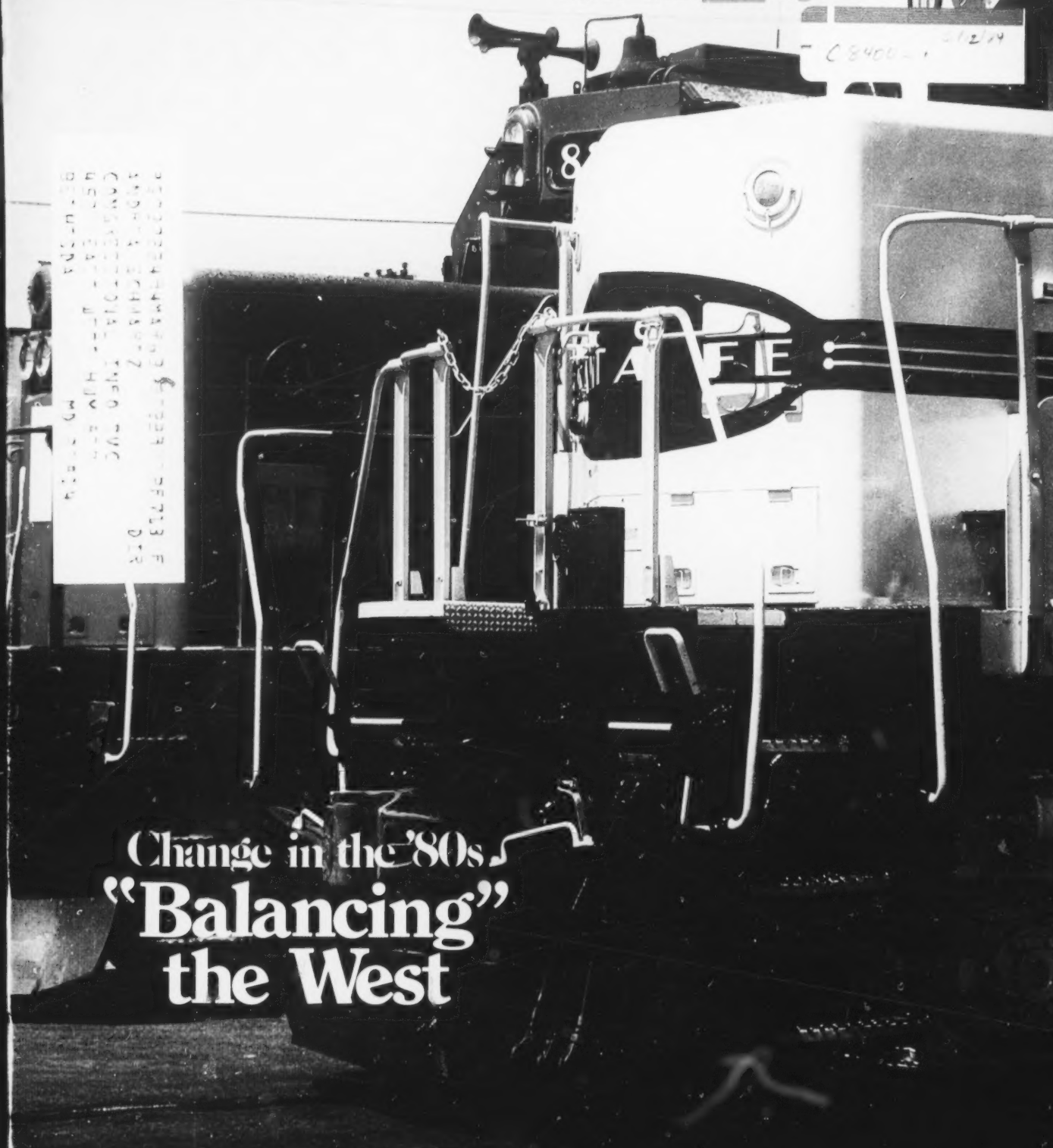
1984

June 1984

SEPTA: Winning
a game of catch-up

RAILWAY AGE

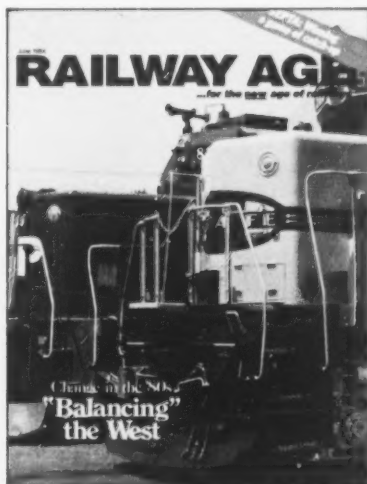
...for the new age of railways



Change in the '80s
"Balancing"
the West

RAILWAY AGE

...for the new age of railways



Cover: Photo by Don Erb. Page 35.



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Features

35 Change in the '80s: "Balancing" the West

The combined benefits of merger and deregulation have tipped the scales in favor of BN and UP. By joining forces, Santa Fe and SP hope to restore a balance.

40 Here come the robots!

In railroad and railroad supplier shops, the application of robotics is fairly new, but it's growing—and there could soon be a veritable robot population explosion.

44 Ties and fastenings: Guardians of the gauge

The timber-tie cut spike combination is still the standard. But direct-fixation fastenings and other-than-wood ties are mounting a challenge.

54 CP Rail signals for greater capacity

CP, which is spending hundreds of millions on new construction in the West, is also investing heavily in C&S to increase the productivity of its existing track.

61 Will this Pegasus fly?

Pullman Standard Manufacturing is entering the lightweight coal-car race with a mostly-aluminum unit that weighs 41,400 pounds and can carry 111,000 pounds.

63 Alaska's "battleship" car

Tailored in its present version to meet the rugged requirements of the Alaska Railroad, the versatile new PCF car can easily be adapted for the Lower 48.

66 SEPTA: Winning a catch-up game

The Philadelphia agency is recovering from the trauma of taking over Conrail commuter operations, and is showing improvements in its other transit services.

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Inside

A delicate balancing act

The courtship of the Southern Pacific by the Santa Fe (or was it the other way around?) was not an easy one. At one time the parties huffily called the whole thing off. It soon became clear that not only could two live cheaper than one, but that, together, their chances for survival in the rough-and-tumble New West would be considerably enhanced. So the banns have now been posted at the ICC. How this marriage, if consummated, could help achieve a balance of power in the West is the subject of Senior Editor Gus Welty's cover story in this issue (p. 35).

Will this be the last of the major mergers? Maybe. Maybe not. It all depends on what happens to Conrail.

Two leading contenders for Conrail's hand—encouraged by matchmaker DOT—have been Norfolk Southern and CSX. But now Conrail Chairman Stanley Crane has been heard from, and he sees union with either as more baleful than blissful. Watching Washington (p. 16) will tell you why.



LUTHER S. MILLER

China by rail, anyone?

Everyone, it seems, is touring China these days; but few are doing it in the style that has become the hallmark of the *Railway Age International Railway Journal* Professional Rail Tours, of which the third is scheduled for Oct. 19-Nov. 3 of this year.

The *Railway Age IRJ* delegation, which I will head this year, will travel some 2,500 miles in one of a handful of deluxe private railway cars that the Ministry of Transport reserves mainly for Chinese political leaders and visiting heads of state. While the tour will be heavily oriented toward professional railroading, there will also be ample opportunity to see exotic sights—such sights as the Great Wall, the Ming Tombs, and the Forbidden City.

The professional part of the program will include optional visits to a large number of railroad installations—a hump yard at Peking that classifies up to 20,000 cars a day; a signal factory at Xian; the Nan Ko Rolling Stock Machinery Works; the "February 7th" Locomotive Factory; the technologically-dazzling Chengdu/Kunming railway line; the Peking Metro; a railway test track. Suppliers will have the opportunity to make technical presentations to Ministry of Railways officials.

Our delegation will leave San Francisco Friday, Oct. 19, and end up in Hongkong Saturday, Nov. 3. Further information is available from Roman Specialty Tours, P.O. Box 1607 Lafayette, Calif. 94545, tele. (415) 284-9180.

Market Outlook

Equipment

CN Rail: In addition to the previously announced purchase of 48 new locomotives from EMD and Bombardier at a cost of \$80 million (Canadian), CN Rail will spend \$22.7 million this year to re-manufacture 32 1,750-hp units and \$16.7 million to rebuild 500 electric traction motors. The work will be performed at the Pointe St. Charles shops in Montreal.

• Will also invest \$20 million in new m/w equipment this year. The following contracts have already been awarded: Tamper Division of Canron Inc.—three combination tampers, two production tie inserters, two tie gang spikers, \$1.4 million; Bert Pyke Limited—three combination ballast regulators, two on-track brush cutters, eight tie cranes, \$1.2 million; Kershaw Manufacturing Canada Limited—five combination ballast regulators, \$600,000; Plasser Canada Limited—one ballast undercutter, two combination tampers, one turnout tamper, \$1.9 million. CN will also acquire, for a total of \$1.8 million, three tie gang spikers from Eastern Railway Supplies and Prairie Equipment Limited; two production tie inserters from Loram; one front end loader from Clark Equipment; a speed swing machine from Pettibone Corp; a grader from Champion Road Machinery; a container handler from Raygo Wagner; and three highway tractors from Ford Motors.

CP Rail: A planned \$7-million track-machine program for 1984 includes the following purchases that have already been made: from the Tamper Division of Canron, seven production tampers, three spike drivers, one laser liner attachment and one switch undercutter, \$1.7 million; from Bert Pyke Limited, seven tie spacers, one 18-ton rail-mounted crane and one brush cutter, \$900,000; from Modern Track Machinery Canada Ltd., 11 power track wrenches, four rail grinders, two rail lifters and two hydraulic spike pullers, \$135,000.

Maryland DOT: Ordered 11 stainless steel push-pull cars from Sumitomo at a total

Freight car orders and deliveries

	DELIVERED		March 1984	Four Months	
	1984	April 1983		1984	1983
Built new by carbuilders	722	205	894	2,559	1,390
Built new in RR shops	0	0	0	0	200
Built new—total	722	205	894	2,559	1,590
Rebuilt	0	0	0	0	0
TOTAL DELIVERED	722	205	894	2,559	1,590

	ORDERED				
To be built new by carbuilders	672	614	1,213	6,144	1,619
To be built new in RR shops	0	1	0	0	3
To be built new—total	672	615	1,213	6,144	1,622
To be rebuilt	0	0	0	0	0
TOTAL ORDERED	672	615	1,213	6,144	1,622

ON ORDER AND UNDELIVERED

	May 1		April 1 1984	Average Backlog	
	1984	1983		1984	1983
To be built new by carbuilders	6,742	4,323	6,928	6,467	4,108
To be built new in RR shops	0	3	0	0	65
To be built new—total	6,742	4,326	6,928	6,467	4,173
To be rebuilt	0	0	0	0	0
TOTAL ON ORDER	6,742	4,326	6,928	6,467	4,173

Source: American Railway Car Institute

cost of \$10,386,000, with an option for four additional cars. Delivery is to be completed by the end of 1985.

Massachusetts Bay Transportation

Authority: Signed a \$52-million contract with UTDC (USA) Inc. for the supply of 56 Red Line rapid transit cars. The cars will be manufactured by Can-Car Rail of Thunder Bay, Ont., a subsidiary of UTDC Ltd. and Hawker Siddeley of Canada; final assembly will take place within the Boston area.

Soo Line: Ordered six 3,000-hp SD40-2 diesel-electric units from Electro-Motive Division of General Motors.

Union Pacific System: Ordered 60 3,600-hp SD50 diesel-electric units from Electro-Motive Division of General Motors at a cost of \$66.5 million. The locomotives are being acquired for operation on Missouri Pacific, and deliveries are scheduled to begin in September. (De-

tails on p. 27).

Facilities

CN Rail: Purchased 165,000 tons of rail, worth approximately \$105 million (Canadian), for the railway's 1984-1985 track program. This is 25,000 tons more than CN purchased last year. Sydney Steel Corp. will supply 125,000 tons of standard carbon and high silicon steel rail worth almost \$80 million; Algoma Steel will furnish 33,000 tons of standard carbon steel rail worth about \$20 million; and Japan will supply about 7,000 tons of premium rail worth \$5 million.

Singapore Mass Rapid Transit Corp.:

Awarded a \$23-million contract to Cubic Western Data to supply an automatic fare collection system—a turnkey contract calling for Cubic to design, produce and install nearly 1,000 major pieces of equipment at 44 stations.

Market Indicators

DRI Railroad Industry Monitor

The latest Data Resources, Inc., forecast is optimistic about continued economic growth, but the risk of an overheated economy followed by a 1985 recession remains substantial. If growth slows enough during the next months to ease the demand for credit and the pressure on interest rates, then the prospects for continued growth are good. However, if growth does not begin to taper off, a clash between private-sector credit demand and the need to finance the federal deficit appears inevitable, with a brief recession in 1985 and early 1986 the likely outcome.

Even though DRI expects a potential credit-clash recession to be relatively mild, the railroad industry would feel the impact. Under the recession scenario, railroads would produce about 1% more revenue ton-

	1983:4	1984:1	1984:2	1984:3	1984:4	1985:1
Economic Indicators (annualized rates)						
Real GNP (% change).....	5.0	8.3	3.8	3.9	2.2	2.0
Industrial production (1967=1.0)...	1.56	1.60	1.62	1.65	1.66	1.67
Housing starts (mil. units).....	1.70	1.95	1.83	1.77	1.68	1.61
Retail car sales (mil. units).....	9.9	10.6	10.6	10.5	10.4	10.4
Raw steel production (mil. tons)....	22.2	26.1	27.7	24.5	25.7	28.5
Total Class I Rail Traffic						
Millions of tons.....	326.4	338.4	339.0	337.1	339.0	323.7
Billions of ton-miles.....	216.6	223.0	220.1	215.6	220.6	224.4
Key Commodities						
Grain.....	36.2	36.2	30.9	28.2	30.8	32.1
Coal.....	124.1	133.4	129.7	130.6	137.7	128.9
Pulp & paper.....	9.2	9.3	9.4	9.1	9.0	9.2
Chemicals.....	25.5	27.3	26.6	25.9	26.0	27.8
Motor vehicles.....	5.6	6.1	6.4	5.0	5.9	5.5

Source: Data Resources, Inc., May, 14, 1984

miles through the second quarter of 1985, but after that, the recession would drive ton-miles 4% to 7% below the trend forecast. The possibility of this downturn is particularly troublesome for freight car and lo-

comotive manufacturers. Until the government acts to reduce the deficit and lower the chance of a recession in 1985, railroads will be very cautious about ordering new equipment.

Revenue freight carloadings

Commodity	May 12 week	% change from 1983	May 5 week	% change from 1983	Apr. 28 week	% change from 1983	Apr. 21 week	% change from 1983	Apr. 14 week	% change from 1983
Grain.....	23,482	14.1	24,075	10.4	23,891	13.3	25,231	12.2	29,660	42.8
Other farm products.....	3,900	4.0	3,765	0.6	4,175	8.9	4,351	21.0	4,435	23.9
Metallic ores.....	18,673	(10.1)	18,236	(11.5)	17,600	(14.6)	16,756	6.8	16,946	7.3
Coal.....	109,102	6.6	117,731	17.0	109,726	11.5	120,973	23.7	120,068	22.9
Crushed stone, gravel and sand.....	12,704	16.9	11,727	11.1	11,703	19.8	11,370	13.8	10,968	16.1
Nonmetallic minerals.....	11,153	(4.5)	11,300	9.4	12,717	8.0	11,566	0.0	10,943	(12.2)
Grain mill products.....	10,643	(7.7)	10,889	(3.3)	10,202	(9.3)	9,953	(12.4)	10,505	(12.7)
Food and kindred products.....	10,450	(12.4)	11,010	(7.4)	10,847	(12.1)	10,253	(19.1)	11,200	(8.6)
Primary forest products.....	14,007	(10.3)	13,799	(10.3)	14,666	(4.7)	13,989	(9.5)	14,304	(3.1)
Lumber and wood products (except furniture).....	7,184	(2.4)	7,317	1.7	7,914	2.6	7,277	0.5	7,616	8.3
Pulp, paper and allied products.....	14,574	(3.3)	14,768	(2.1)	14,859	(3.8)	14,277	(4.2)	14,435	(5.5)
Chemicals and allied products.....	25,639	11.0	26,210	10.4	26,759	8.1	24,250	6.5	26,368	19.4
Petroleum products.....	4,658	1.2	4,863	3.5	5,147	(0.4)	4,538	(5.7)	5,140	10.6
Stone, clay and glass products.....	12,144	7.3	11,834	10.5	11,797	11.0	11,205	7.5	11,380	11.2
Coke.....	5,602	19.1	5,942	22.3	5,845	20.4	5,548	16.6	5,558	19.3
Metals and products.....	10,357	27.7	11,322	41.4	10,689	9.5	10,422	16.8	10,531	23.3
Motor vehicles and equipment.....	21,166	17.6	20,857	16.5	20,054	12.5	18,237	3.1	20,799	18.5
Waste and scrap materials.....	10,273	17.9	9,787	19.6	10,038	15.6	9,381	10.4	10,538	20.9
Forwarder and shipper assn. traffic.....	7,380	(9.7)	7,206	(14.1)	7,035	(18.4)	6,896	(22.3)	7,502	(13.6)
All other carloads.....	60,234	22.8	60,813	23.0	58,117	11.7	57,213	19.1	60,490	24.6
LCL traffic.....	248	(3.1)	226	(11.0)	233	2.6	246	(2.8)	270	14.4
Total Cars Loaded	393,573	7.1	403,677	10.7	394,014	6.4	393,932	10.1	409,656	15.4

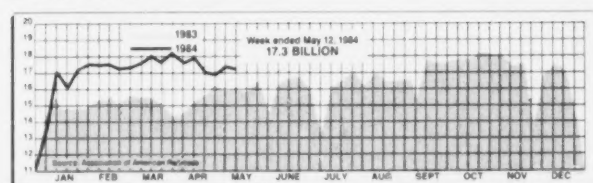
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
19 weeks.....	327.8	288.8	13.5

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers containers 1984	% increase from 1983
April 7.....	53,901	38.8	89,795	34.0
April 14.....	52,917	21.7	89,987	18.6
April 21.....	50,453	14.0	85,368	11.8
April 28.....	50,406	9.8	84,686	7.1
May 5.....	52,648	17.4	88,445	14.4
Cumulative total, 18 weeks	904,132	18.7	1,567,585	19.6

Rail freight traffic trends

Billion ton miles (Estimated)



Microprocessor controls new PFE thermostat

Digital Dynamics Inc. (DDI) has produced a microprocessor-based thermostat for Pacific Fruit Express that PFE calls "a breakthrough in refrigeration control technology."

A prototype REMAT (for Refrigeration Monitor and Telemetry) system passed a critical test when a carload of iceberg lettuce arrived in San Antonio, Tex., in perfect condition after a five-day trip from Huron, Calif. PFE has decided to equip its entire 4,500-car fleet with the system over the next two years; 500 of the cars will have the new thermostats by September. Some 20 of these will have a fuel-saver option designed to monitor and control fuel consumption of the diesel engine used to power the refrigerator.

PFE says REMAT performs six basic functions: "Air temperature control to ± 0.25 degrees Fahrenheit; discharge air temperature limited control to protect loads from top freezing; automatic "real-ice" calibration of the temperature sensors; failsafe watchdog system monitor and backup; 30-day record log of temperatures, power up/down and set point entry events; continuous transmission of the historical log file and current data via a panel-mounted infra-red emitting diode (IRED). The accuracy of REMAT is possible because of a unique sensor developed by DDI which places the electronic sensing element inside a glass vial filled with a pure chemical and surrounded by a small heater element. When the computer decides to perform a calibration, it uses the heater to melt the chemical, then turns off the heater and monitors the temperature as it cools. When the chemical undergoes phase change back to a solid, the temperature briefly stops falling due to the release of the heat of fusion. The computer notes the sensed temperature at that instant, and then compares this reading to the true melting point stored in its permanent memory. If necessary, a correction factor is computed and stored in the computer's battery protected memory to correct future measurement. Since the chemical's melting point will not change with time, the basic REMAT accuracy is assured indefinitely."

James B. Jerde, president of Digital Dynamics, says the "real-ice" calibration is a "truly unique" feature in thermostat design. He also believes the data logging and continuous transmission of the log file "may someday be recognized as a technological landmark, pioneering similar designs in virtually every industrial control field."



PFE's Raymond H. Barker with new REMAT system, which senses both return and discharge air temperature and regulates the entire refrigeration system.

This telemetry feature means that a PFE maintenance technician outside of a car, using a hand-held readout device, can within two seconds collect a 30-day history of the system's temperature control performance and other data for evaluation.

Accompanying the test shipment to San Antonio, in the Southern Pacific business car "Pine Bluff," were DDI's Jerde and two PFE officers—Thomas D. Ellen, vice president and general manager, and Raymond H.

Barker, division general manager-protective services. Ellen said REMAT would allow PFE to offer its customers "the highest confidence level available in the refrigerated cargo shipping industry."

Twelve railroads beat the average

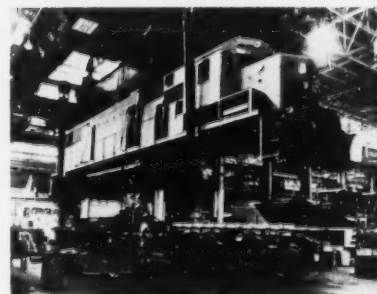
Class I railroads as a whole had an average return on investment of 3.69% in 1983, up from 2.30% in 1982, according to the ICC. Twelve of the 30 reporting roads topped the average. This is how they ranked:

1. Burlington Northern 8.22%
2. Kansas City Southern 6.33%
3. Southern 6.02%
4. Missouri-Kansas-Texas ... 5.70%
5. Chicago & North Western. 5.65%
6. Norfolk & Western 5.33%
7. Missouri Pacific 4.86%
8. Union Pacific 4.60%
9. Elgin, Joliet & Eastern ... 4.22%
10. Seaboard System 4.17%
11. Conrail 4.10%
12. Chesapeake & Ohio 4.11%

UP's new-power program swings into place

General Motors' Electro-Motive Division is getting the order for the first new locomotives to be acquired by Union Pacific System since it was formed in December 1982 through consolidation of UP, Missouri Pacific and Western Pacific. The \$66.5-million order is for 60 3,600-hp SD50 units for MoPac, with deliveries scheduled to begin in September; the units will be equipped with dynamic braking and EMD's latest wheel-slip-control system.

UP System still has motive power stored, and, as Chairman and Chief Executive Officer John C. Kenefick told *Railway Age* recently, "We don't need more horsepower now," and so the purchasing decision was based primarily on an overall look at the economics. Kenefick put it this way (RA, April, p. 37): "In prior years, we made up our programs based on traffic projections. We made traffic forecasts, we knew how much horsepower we needed to meet certain traffic volumes, and we just bought enough power to stay ahead of traffic demands. Now, we've been looking more at the total



Crane lowers SD50 onto its wheels at EMD's LaGrange plant, where 60 of the new locomotives are being built for Union Pacific.

economics. We're looking at possible fuel savings and maintenance savings, and at the fact that even if we don't need additional horsepower it might make sense to upgrade the quality of the fleet. It's a case of balancing things, the purchase price, the operating and maintenance savings, and the fact that locomotives we brought out of storage might not measure up."

NOTE

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**Miami enters
the Metro era**

July 1984

RAILWAY AGE

...for the new age of railways

Change in the '80s

The meaning of merger

Midyear report

The state of the industry

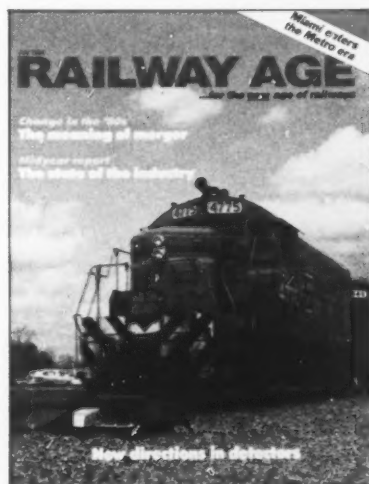


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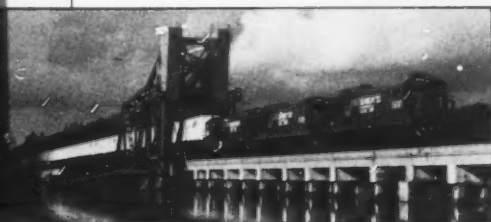
New directions in detectors

RAILWAY AGE

...for the new age of railways



Cover: Hotbox detector on Seaboard; photo by Roy Blanchard. *Page 78.*



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Features

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Traffic, revenues, and profits are climbing—but prospects of a Staggers backlash and difficult labor negotiations are clouding the long-term outlook.

41 1984 Contract Car Repair Directory

Railway Age's updated directory of contract shops lists facilities (and their capabilities) both by company name and geographical location.

73 Change in the '80s: The meaning of merger

The verdict is in on the mega-mergers: They're producing the promised economies of scale. Still to be fitted into the picture are Santa Fe-SP, Conrail, and Milwaukee.

78 Detectors get smarter

Changes in the state-of-the-art—and in railroad requirements—are resulting in the upgrading and refining of thousands of detectors that are now in place.

85 Canada's western strategy

To help Canada achieve its export goals across the Pacific, CN Rail, CP Rail, and BC Rail are investing billions of dollars to expand their carrying capacity.

90 Moving day in Miami

"People Moving People" is Metro-Dade's promotion slogan—and it seemed particularly apt on May 20, a day of flamboyant fanfare and city-wide celebration.

93 Light rail's Cinderella

Approaching its 50th birthday, the Newark City Subway is emerging from a modernization program with a new look—and a virtually new roadway.

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Inside

Profits and paradoxes

A friend who is in the banking business asked us the other day how the railroads were doing. Our reply was, "They are doing beautifully, and as a result they are in deep trouble." The paradox in that statement is reflected in the headline that appears over our midyear report on the state of the industry—"The comeback blues." It is explained (though probably not to the satisfaction of the electric utilities and the railroad labor organizations) in the text that follows.

It is a fact that the railroads this year are turning in a quite remarkable financial performance: First-quarter profits of nearly \$600 million were triple those of the corresponding 1983 period. For the year as a whole, net earnings could top \$2.5 billion. Return on investment is nudging 5%.

But the railroads could turn out to be victims of their own success. Certain big shippers, led by utility and coal interests, are saying that the Staggers Act, which has helped produce the turnaround, has worked all too well and that it's time now to turn back the clock. The unions, for their part, are making demands that could wipe out the productivity gains that have also contributed mightily to the railroad comeback.

Says AAR President William H. Dempsey: "There's a lot of euphoria around right now, but it isn't entirely justified."

That's what "The comeback blues" is all about. It starts on p. 37.

Busy days north of the border

CN Rail moved 16.4 billion gross ton miles of freight in May of this year, more than in any other month in its history. The previous record was 14.7 GTMs in May 1981.

"Our determination to press ahead with expansion work in the West even during the recession year of 1982 has stood us in good stead," says Ronald E. Lawless, CN Rail's president and chief operating officer. "Without the added capacity we've built into the system since 1980 we simply could not have handled this record amount of freight."

CN Rail is not alone in its reconquest of the West. Rival CP Rail is also pushing for expanded capacity to help position Canada for a major thrust into the markets of Asia. Smaller but no less aggressive, British Columbia Rail is doing its part. Altogether, the three railroads will invest close to \$5 billion in expanding western rail capacity by 1990.

"Canada's western strategy" is described by Associate Editor Frank Malone in the story that starts on p. 85.



LUTHER S. MILLER

Market Outlook

Equipment

Amtrak: Will rebuild six former Santa Fe bi-level dining cars and six former Southern single-level coach lounge cars into food service cars at Beech Grove, Ind.

CN Rail: Placed a \$1-million order with Ryder J.H. Machinery Ltd. for three heavy-lift container handling machines manufactured by Clark Equipment.

Government of Canada: Will acquire 2,460 grain hopper cars this year—980 from National Steel Car, 620 from Marine Industries, and 860 from Hawker-Siddeley Canada. The government ordered 1,380 cars last year. The new orders will fulfill the government's promise to acquire 3,840 new grain cars by the end of 1985.

Southern Pacific: Ordered 50 new diesel-electric locomotives at a cost of \$52 million. The Electro-Motive Division of General Motors will supply 34 3,000-hp GP40 units; General Electric will supply 16 3,750-hp B36-7 units. Delivery is to begin in September.

- Placed a \$5.1-million order with Thrall Car for 150 fully-enclosed tri-level auto-racks. Delivery will begin in August.

Union Pacific System: Ordered 615 auto-racks—345 tri-levels and 270 bi-levels—from Portec, for delivery this fall. The order, valued at \$18.8 million, is in addition to a previous order for 325 auto-racks (RA, April, p. 12).

Facilities

Bay Area Rapid Transit: Is requesting proposals for construction management services for its \$150-million Daly City Turnback and Yard Project, which will involve 27 separate contracts. The estimated construction management fee, over a three-year period, is \$3.5-to-\$4 million.

Chessie: Is installing a \$14-million IBM

Freight cars

	DELIVERED		April 1984	Five Months	
	1984	May 1983		1984	1983
Built new by carbuilders	755	376	722	3,127	1,766
Built new in RR shops	0	0	0	0	200
Built new—total	755	376	722	3,127	1,966
Rebuilt	0	0	0	0	0
TOTAL DELIVERED	755	376	722	3,127	1,966

	ORDERED				
To be built new by carbuilders	1,301	797	672	7,445	2,416
To be built new in RR shops	0	0	0	0	3
To be built new—total	1,301	797	672	7,445	2,419
To be rebuilt	0	100	0	0	100
TOTAL ORDERED	1,301	897	672	7,445	2,519

	ON ORDER AND UNDELIVERED		May 1 1984	Average Backlog	
	June 1 1984	1983		1984	1983
To be built new by carbuilders	5,723	4,744	6,742	6,317	4,235
To be built new in RR shops	0	3	0	0	53
To be built new—total	5,723	4,747	6,742	6,317	4,288
To be rebuilt	0	100	0	0	20
TOTAL ON ORDER	5,723	4,847	6,742	6,317	4,308

Source: American Railway Car Institute

Locomotives (new and rebuilt)

DELIVERED	1984	1983	BACKLOG	1984	1983
April	39	28	May 1	249	127
March	28	26	April 1	93	134
Four Months	115	90	Average	127	77

Source: Transportation Div., AAR

model 3084QX IBM mainframe computer system at its operating headquarters in Baltimore. The system includes 48 million bytes of main memory, 61 billion bytes of on-line disk storage and can perform 29 million instructions per second.

Conrail: Placed a \$400,000 order with General Electric for 80 Series Six programmable controllers to monitor and remotely control switches and signals.

Glenayre Electronics: Has received orders exceeding \$3 million (Canadian)

from Chessie and Conrail for the DIGI-TAIR rear-of-train information system. Orders for test programs have been placed by CN Rail, CP Rail, Illinois Central Gulf, and Santa Fe.

Sacramento Transit Development

Agency: Pacific Rail Road Constructors of Torrance, Calif., is the apparent low bidder (at \$3,964,550) for construction of the first 5.3-mile segment of STDA's 18.3-mile light rail line. The bid was 12% below the agency's estimate.

Market Indicators

DRI Railroad Industry Monitor

The rail traffic recovery that began in the end of 1982 is now expected to peak by the third quarter of this year. Coal traffic will weaken as utilities complete their stockpile building in anticipation of a UMW strike, and whether or not there is a lengthy strike fourth quarter coal carloadings will be down sharply. The overheating economy has choked off the recovery in housing, and the demand for a wide range of building materials has already softened. New car sales have held up well despite the rise in interest rates, but sales are expected to fall off slowly during the second half of the year.

While the expected decline in rail traffic will put pressure on earnings, it may ultimately help the railroad industry. Unless management negotiators can win a pact combining productivity gains and wage restraint, the railroad industry will continue to

	1984:1	1984:2	1984:3	1984:4	1985:1
Economic Indicators (annualized rates)					
Industrial production (1967 = 1.0)...	1.60	1.64	1.67	1.68	1.69
Housing starts (mil. units)	1.96	1.85	1.77	1.67	1.60
Retail car sales (mil. units)	10.6	10.6	10.5	10.5	10.4
Raw steel production (mil. tons)	25.1	28.2	24.2	25.4	28.3
Total Class I Rail Traffic					
Millions of tons	338.4	347.7	341.3	331.5	322.2
Billions of ton-miles	223.0	223.6	218.9	218.2	224.6
Key Commodities					
Grain	36.2	30.9	28.2	30.8	32.1
Coal	133.4	133.7	134.5	131.7	127.6
Lumber & wood	5.1	5.4	5.1	4.8	4.7
Pulp & paper	9.3	9.0	8.8	8.6	8.9
Chemicals	27.3	26.8	26.2	26.2	28.0
Motor vehicles	6.1	6.3	5.1	5.9	5.5

Source: Data Resources, Inc., June 25, 1984

lose market share in manufactured goods to trucks and the rail unions will continue to lose jobs at a rapid rate. If the slowdown in traffic brings an added sense of urgency to

management and an added sense of realism to rail labor, the long-term benefits of the traffic slowdown will outweigh the short-term losses.

Revenue freight carloadings

Commodity	June 16 week	% change from 1983	June 9 week	% change from 1983	June 2 week	% change from 1983	May 26 week	% change from 1983	May 19 week	% change from 1983
Grain	24,062	(2.8)	24,078	11.9	21,308	25.7	23,171	6.3	23,764	23.7
Other farm products	3,766	(18.6)	3,985	(17.3)	3,838	8.6	3,823	(9.6)	3,905	10.0
Metallic ores	19,133	(11.4)	21,997	0.8	19,017	2.0	20,736	(1.2)	20,232	(2.3)
Coal	125,628	19.9	129,610	24.5	114,693	25.7	130,573	24.9	121,390	20.8
Crushed stone, gravel and sand	12,880	9.8	13,041	13.1	10,583	9.0	13,218	19.8	13,062	18.8
Nonmetallic minerals	12,814	26.3	12,467	14.7	11,415	6.7	10,583	(8.5)	12,526	14.8
Grain mill products	10,070	(9.4)	10,702	(9.9)	9,422	(8.5)	11,059	(6.7)	10,746	(5.4)
Food and kindred products	10,708	(1.8)	10,971	(0.7)	9,398	(5.7)	10,843	(9.0)	10,583	(9.9)
Primary forest products	13,733	(8.3)	14,347	0.0	13,004	(3.0)	14,186	(1.7)	14,711	1.7
Lumber and wood products (except furniture)	7,219	(4.1)	7,371	(5.5)	6,597	2.0	7,967	(5.3)	7,207	(8.4)
Pulp, paper and allied products	14,858	(3.5)	15,335	3.5	14,737	1.3	15,322	(2.1)	14,328	(6.8)
Chemicals and allied products	23,020	2.0	23,769	6.2	22,117	10.8	27,274	22.9	26,892	19.9
Petroleum products	4,870	3.2	4,768	0.9	4,192	2.0	4,882	3.1	4,780	(0.2)
Stone, clay and glass products	11,662	7.0	11,660	3.8	10,433	4.9	12,199	7.6	12,160	12.3
Coke	6,029	12.0	5,954	9.5	5,802	11.3	5,718	6.8	5,676	16.7
Metals and products	9,816	17.7	9,510	19.5	10,620	32.5	10,566	20.9	10,255	24.3
Motor vehicles and equipment	20,999	13.0	20,493	7.3	17,356	12.1	20,272	9.6	21,337	14.7
Waste and scrap materials	9,626	15.3	9,884	17.6	8,795	28.5	10,593	17.9	10,412	19.2
Forwarder and shipper assn. traffic	7,098	(16.3)	7,427	(9.6)	5,963	(16.7)	6,570	(25.2)	7,118	(17.1)
All other carloads	58,548	12.6	60,980	25.0	52,785	22.5	63,134	22.2	59,367	18.8
LCL traffic	237	10.2	219	(22.9)	200	(11.5)	273	(8.4)	242	(10.7)
Total Cars Loaded	406,776	7.9	418,568	12.8	372,280	14.4	422,962	12.2	410,693	12.8

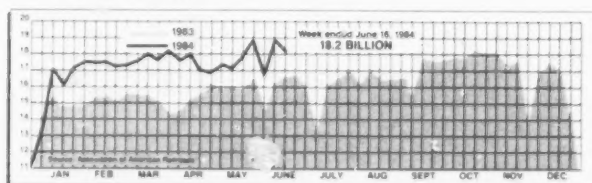
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
24 weeks	426.4	367.7	16.0

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers containers 1984	% increase from 1983
May 12	52,706	19.5	89,716	16.6
May 19	52,436	16.2	87,721	11.6
May 26	52,836	13.6	88,786	10.1
June 2	43,356	10.2	77,582	15.9
June 9	50,027	13.2	87,924	14.5
Cumulative total, 23 weeks	1,157,835	18.0	1,998,321	18.2

Rail freight traffic trends

Billion ton miles (Estimated)



Midyear report: The comeback blues

Traffic is up, costs are under control, and earnings are soaring. But the very strength of the railroad comeback could mean trouble in Congress and at the labor bargaining table.

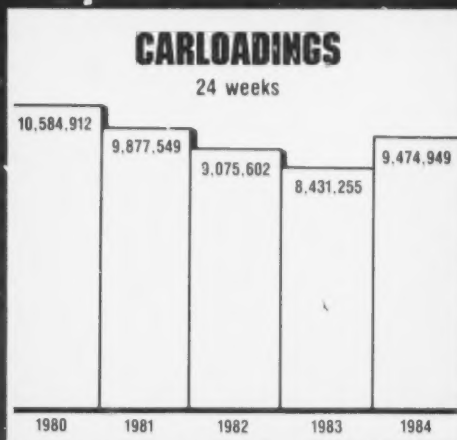
By LUTHER S. MILLER, Editor

Sample the mood of railroad executives at midyear '84, and you find a curious mixture of euphoria and anxiety.

The euphoria is easily accounted for. Traffic is running strongly ahead of '83 levels; revenues are increasing faster than costs; earnings have shot up dramatically. Class I railroads reported net income of over half a billion dollars in the first quarter, which is historically not their best. Barring a downturn not now foreseen, they expect to earn \$2.5 billion before the books are closed on this turnaround year.

Less evident, but no less real, are the reasons for apprehensiveness.

Much of the railroad industry's present prosperity has been gained through skillful exercise of the pricing freedoms granted by the Staggers Act of 1980—and that Act is now under mounting attack in Washington. Shipper lobbies are filling their war chests with



millions of dollars for a 1985 assault on Staggers—a threat that Association of American Railroads President William H. Dempsey regards as "formidable."

Meanwhile, the railroad labor organizations have slapped onto the bargaining table wage, benefit and work-rules demands that, if only partially successful, could put the railroads hopelessly behind in their productivity race with motor carriers, which are rapidly becoming a de-unionized industry.

Rarely has the industry's short-term picture looked so bright and its long-term outlook so cloudy. First, the bright side.

• **The year so far.** By all of the standard measurements, the railroads are going through a period of extraordinary turnaround.

In this year's first quarter, on the strength of a 12% increase in revenue ton-miles, the Class I's posted net income of \$593 million, three times as much as they earned in the "comeback" first quarter of 1983. Revenues were up more than \$1 billion; costs rose by only \$613 million. Contributing factors were continued low levels of employment (in mid-April of this year Class I roads employed 322,525 people, down 1.78% from the

CONRAIL

Financial performance: '84 vs '83

	First quarter 1984	First quarter 1983
Operating revenues	\$7,451,000,000	\$6,376,000,000
Operating expenses	6,819,000,000	6,006,000,000
Net revenue from operations	832,000,000	370,000,000
Ordinary income	593,000,000	182,000,000
Net railway operating income	564,000,000	264,000,000
Rate of return (12 mos. ended Mar. 31)...	4.26%	2.48%

Source: Association of American Railroads

Note: First quarter '84 figures are stated on the new depreciation accounting basis; '83 figures are on the old betterment accounting basis. It's estimated that the new accounting may have had the effect of increasing first-quarter '84 net revenue from operations by 15-20%.

year-earlier figure) and only modest increases, if any, in the costs of fuel, materials and supplies.

Prospects for the rest of the year are good. At midyear, traffic was 16% ahead of '83 levels. That rate of increase will not continue; more and more, this year's traffic will be compared with last year's improving levels. And the anticipated coal miners' strike, which has been responsible in recent weeks for unusually heavy coal traffic as users have built up inventories, will erode about 12% of total ton-miles for its duration.

Nonetheless, the sustained ton-mile increase this year will be in the 8% to 9% range, by conservative estimate, and the railroads expect to more than double last year's net income of \$1.2 billion.

But they also expect, soon after that, to run into some heavy weather.

• **The assault on Staggers.** Most troublesome, right now, is the prospect of having to go back to Capitol Hill next year to re-wage the fight they won in 1980.

A number of shippers want changes in the Staggers Act. Agricultural interests are worried about the confidentiality aspects of contract rates. The National Industrial Transportation League is concerned about the elimination of joint rates, the closing of gateways, and boxcar deregulation.

But it is the utility and coal interests, joined by some consumer groups, who really intend to turn back the clock. They want drastic re-vamping of market-dominance standards; they want the ICC to scrap the cost of capital as a standard for revenue adequacy. And they have banded together as Consumers United for Rail Equity (CURE) to try to persuade Congress to de-gut Staggers.

How strong is the opposition? "Formidable," says the AAR's Bill Dempsey, but he thinks the railroads' have an "impregnable" defense if they can only get it together.

Dempsey demonstrated his own skills as a defender of the faith when he appeared recently before the National Conference of State Legislators to argue against a resolution calling for ten major changes in Staggers—a resolution which NCSL at that time seemed

almost certain to adopt.

It is claimed, said Dempsey, that coal prices are falling while rail coal rates are soaring—a charge, he added, that is "supported with the statistical equivalent of mirrors—the use of carefully selected slices of time." By looking at the 1972-1982 period—"pertinent because it embraces the OPEC oil crisis"—Dempsey was able to redraw the picture.

In 1982, he said, the price of coal was 32% higher in constant dollars than it was in 1972, while coal rates were 3% lower in constant dollars. As for utilities, he noted that between Oct. 1, 1980—the effective date of the Staggers Act—and Jan. 1, 1984, electricity rates rose 44% while coal rates rose only 23%.

"The utilities say that they want to reduce coal rates because their transportation costs are now approaching \$5 billion per year and those costs must be borne by their consumers," said Dempsey. "If they really have only their customers' interests at heart, I suggest that the utilities agree to absorb the billions of dollars of losses in nuclear power plants that will never operate, rather than attempt to pass those costs on to their consumers. If that course isn't appealing, perhaps the utilities should give their customers a break by seeking only a 10% return rather than the 18% they sought and the 14% they earned in 1984."

Dempsey's arguments carried the day, and the anti-Staggers resolution was defeated. He did not even have to point out that while the railroads are now at their most prosperous position in many years, they still have a rate of return that is only slightly more than 4%.

• **The productivity squeeze.** It is not only the backlash against Staggers that is worrying Dempsey and others who try to look beyond this year's financial statements. There is the whole question of where even an unregulated railroad industry is ultimately headed—and how it is going to get there. In a blunt talk before the Railroad Public Relations Association at Colorado Springs in June, Dempsey looked bleakly down the road to a narrowing transportation market, and hopefully to the productivity gains that will help the railroads win a bigger share of that market.

"There's a lot of euphoria around right now," said Dempsey, "but it is not totally justified."

"Yes, business is much better than it was in 1982 and much of 1983. But look at it carefully, leaving piggyback aside since piggyback operates on thin margins. Look at the high-rated stuff. Last time I looked, things like metallic ores, and lumber and wood products were still down from a decade ago."

"Why hasn't this brought gloom? Because railroads moved so aggressively during the recession to reduce their costs. So even moderate traffic growth produced results that suggest greater business growth than has actually occurred."

"Furthermore, every forecast I've seen indicates that the transportation market is not going to grow significantly over the next 10 years. We will no longer be able to count on growth that comes from an overall increase in the total load. If we are to grow, we have to increase our share."

"Since 1970, we've had a 41% gain in revenue ton-miles per mile of road operated—largely a result of paring away about 15% of the national rail system. And, as a result of drops in employment, revenue ton-miles per employee have grown by more than 50% in that same time period. That's pretty good, but we have to do better."

"Our competition has been growing more productive, too. The law now allows bigger, longer, heavier trucks to challenge railroad piggyback service. Trucking companies have moved to reduce their employment of Teamster drivers in favor of independent contractors."

"It is time for the leaders of our railroad unions to recognize that the interests of their members lie in helping this industry to grow. It is time for them to understand that true leadership is not clinging blindly to every crumb of unearned advantage that they have ever been able to get—but in analyzing the situation and recognizing the simple truth that they can only prosper as the railroad industry prospers."

• **The showdown.** What Dempsey was saying was that any real railroad growth in the future is going to come from the highways—and in the showdown, it's the high-productivity carrier that is going to win.

Right now, the truckers seem to have the edge. AAR Executive Vice President Richard E. Briggs analyzes the situation this way:

"According to the ICC, since 1980 the number of regulated motor carriers has increased from under 18,000 to almost 31,000—a 74% increase. Most of these new entrants are non-union, truckload carriers, offering lower wages. Additionally, some 125,000 non-regulated, non-union owner operators deliver intercity freight, and recent regulatory reforms are allowing growth in private carrier operations. Between 1977 and 1982, Teamster membership among rail-competitive truck operators declined from 26% to 17%."

For suppliers, a slow turnaround

Many railroad capital-improvement budgets are at record or near-record highs this year. Burlington Northern is spending \$684 million, up from \$575 million last year. Conrail has budgeted \$520 million vs \$450 million in '83. Norfolk Southern's planned outlays of \$510 million are more than double actual '83 expenditures. SP has hiked capital spending to \$340 million from \$286 million last year.

But a large number of old-line equipment suppliers continue to suffer. This is because capital budgets, which until a few years ago were heavily tilted toward freight cars and locomotives, now lean toward plant improvements—in particular, track work. In any case, this year's budgets are inflated in comparison with those of previous years due to the switch-over from betterment to rateable depreciation accounting—which means that track work that used to be charged as an operating expense is now carried as a capital outlay.

Still, 1984 has turned out to be a distinct improvement over 1983. In this year's first five months, 7,445 new freight cars were placed on order—more than triple the 2,419 that were ordered in the comparable 1983 period. Locomotive orders are also running ahead of a year ago. In this year's first four months, 115 new locomotives were installed, up from 90 in the '83 period; the undelivered backlog of locomotives on May 1 was 249, nearly double the 127 on order a year ago.

The outlook is for a continuing though relatively slow improvement in equipment orders. Carbuilders estimate that around 15,000 cars will be ordered and 13,000 installed this year. They are more optimistic for 1985, when they see orders recovering to around the 25,000-car level with deliveries climbing to around 20,000.

One reason for the slowdown in equipment orders is the substantially increased utilization that mergers and deregulation have brought about. Despite the 16% increase in traffic so far this year, a vast fleet of cars and locomotives remains in storage.

But many of these may never come out of storage. As more efficient equipment comes onto the market, many railroads will buy it in preference to de-mothballing and/or rebuild-

"A three-year contract signed between motor carrier management and the Teamsters Union in 1982 reflects the success of non-union trucking operations. The Teamsters agreed to no general wage increases, reduction in cost-of-living adjustments, and significant work rules improvements designed to further increase truck productivity.

"Since 1980, motor carrier wage increases have lagged significantly those of the railroad industry. Between 1972 and 1983, average an-

FREIGHT CARS: 1985 market forecast					
		Average	Median	Low	High
1985 orders	All respondents	26,300	30,000	10,500	57,000
	Carbuilders	25,400	23,400	15,000	40,000
	Others	30,800	32,000	10,500	55,000
1985 deliveries	All respondents	23,000	25,000	12,000	35,000
	Carbuilders	21,400	20,300	15,000	30,000
	Others	24,300	25,000	12,000	35,000
Respondents: 11 Carbuilders					
13 Components and Others					
Source: American Railroad Car Institute					

ARC's 1985 market forecast shows that there is considerable difference of opinion among carbuilders and their component suppliers as to what the future holds.

ing older equipment. This is particularly the case with locomotives. Donald M. Tutko, who is now chief mechanical officer of the Seaboard System and before that was CMO of Missouri Pacific, recently told the following story:

"A year and a half ago, I was involved with a group of associate mechanical officers in developing a program to remanufacture some early model SD-40 locomotives. Our plan was to produce a unit equal to the SD-40-2 locomotive which has been an excellent performer. The SD-40-2 was the workhorse of both our fleets and, given its reliability and maintenance cost, it seemed technologically sound and cost effective to remanufacture older units to the SD-40-2 configuration. But before we finalized our plans, a visit to EMD awoke us to the significant advances in design that EMD was about to announce. Their advances in electrical control and fuel economy quickly convinced us that remanufacture was no longer cost effective. We soon found that both locomotive manufacturers were about to adopt microprocessor technology to their next generation of units."

Other CMO's, as it turned out, were thinking along the same lines—and as a result,

several hundred new locomotives have been ordered during a time when thousands have been in storage.

On a smaller scale, a similar story can be told of freight cars. While many thousands of coal cars remain in storage, the emergence on the scene of new lightweight aluminum and aluminum/steel cars has resulted in orders for several hundred. Alcoa, a main supplier of the lightweight metal, is predicting that as many as 7,000 aluminum cars a year could be coming off the line by 1990.

Meanwhile, a whole new generation of piggyback cars is in the making. TTX, which expects to acquire up to 28,000 new piggyback "platforms" (the preferred term now that piggyback cars are increasingly multi-platform, articulated units), has already placed or will soon place orders for 2,000.

More existing equipment will be obsoleted if the railroads succeed in their present quest to develop high-productivity integral trains.

The future is bleak for builders accustomed to single runs of 1,000 or more cars (if, indeed, there are still such builders around). It is bright for innovative builders capable of producing specialized cars in relatively small lots.

nual railroad compensation (wages and fringes) increased by 204%—versus a 137% increase in the consumer price index. In 1983, the \$40,792 average annual compensation paid railroad employees was 53% greater than that earned in the trucking industry. The average annual wage of rail workers is greater than that in 58 other industries employing 99% of the domestic work force. Yet, the rail industry ranks near the bottom in terms of financial health."

And that is the bottom line: The railroads look good today only in comparison with where they were yesterday. A less-than-5% return on an investment of \$35 billion is better than it has been—but it's a long way from the riches that some railroad customers and some railroad unions appear to feel that the carriers have fallen into. If Congress as it re-considers Staggers—and if the unions as they press new demands—feel otherwise, then the railroad renaissance could be short-lived. ■



Hybrid, microprocessor-upgraded Servo detector installation on the Seaboard System at Goose Creek, S.C. scanning journals on a passing freight. Current railroad wayside defect detection programs include such enhancements as updated scanner monitoring and electronics, on-site heat-signature processing on the basis of refined alarm criteria, data digitization for transmission, and direct radio "talker" identification to train crew members of multiple types and locations of detected defects.

Photo: Roy Blanchard

Detectors get smarter

With several thousand hotbox, dragging equipment and other detectors now in place, attention is turning to upgrading and refining their already extensive monitoring capabilities.

By JOHN ARMSTRONG,
Associate Editor

On the basis of a *Railway Age* survey, it appears that sometime late in 1982 the number of hotbox detector installations on U.S. and Canadian railroads passed the 3,000 mark. In 1983, quite possibly for the first time in at least a century, the number of train accidents on U.S. railroads attributed to heat-broken journal bearings dipped below 100.

There's a gratifying connection between these two facts, of course, though the relationship is neither simple nor direct when such factors as shifts in bearing types, car capacity, train speeds and car mileage are cranked in. As AAR hotbox detection and bearing failure statistics over the last decade indicate, year-by-year curves are frequently lumpy despite the large numbers involved. Overall, real improvement has been achieved, even though performance of both plain (solid) and roller bearings has remained about the same and today's smarter wayside detection systems are hard put to do much more than stay even with increasingly stringent needs for

sensing and interpreting incipient journal heating indications as the active car fleet creeps toward 100% roller-bearing status.

● **Filling in the gaps.** With the survey showing some 3,100 way side hotbox detector locations in service, most main lines are approaching the 15- to 25-mile-per-scanner installation density most roads believe justifiable; the 700 or so installations projected for this and the next few years are primarily those needed to provide coverage of new or upgraded sections of main line, to bring up to snuff routes whose installations were deferred or delayed for financial reasons, or to fill the occasional gap left due to a variety of reasons now past.

Roads buying scanners will find no dearth of competition. Of the four scanners described in a previous review (*RA*, Nov. 10, 1980, p. 29), only Marine Electric's HB-76 has with its supplier fallen by the wayside.

—Harmon has acquired and continues to provide spares and service support for the pyroelectric-sensor unit previously built by General Electric; with a new cantilever mounting adaptable to any customer-pre-

ferred target of scan (wheel hub, inside- or outside-journal surface) and all-new microprocessor-based electronics, the basic scanner lives on in the Harmon WCO-32 hotbox detector system now in production.

—Servo's current 8909 sensor attaches interchangeably to either rail with its new ISO-CLAMP mounting which also effectively attenuates the most severe levels of rail shock and vibration as well as lightning-induced voltages; as a pioneer in the scanner business and therefore having the largest number of elderly units in the field, Servo is also busy providing kits for upgrading existing 7700-series units with new solid-state preamplifier, micropositioner, and pulse-processor vacuum tube and relay replacements for improved performance over an additional decade or so of service life.

—General Railway Signal's scanner was recently physically and electronically brought up to date; today's possibilities for enhancing data processing and interfacing capabilities with a microprocessor are such that GRS has several complete detector, processor and reporting systems in field test and is now pre-

Detectors: Installed or on the way

	Hotbox			Dragging equipment			Other**		
	In operation Dec. 1983	To be installed 1984	To be installed 1984-89	In operation Dec. 1983	To be installed 1984	To be installed 1984-89	In operation Dec. 1983	To be installed 1984	To be installed 1984-89
Alaska RR				3					
Algoma Central					2	4			
Amtrak	264* + 29	202*	174*	182			2		
Atchison, Topeka & Santa Fe	160	10		193	10		22		
Bangor & Aroostook		2							
Bessemer & Lake Erie	7			11			2		
Boston & Maine	7		9	3		9	3		3
British Columbia			5			5			5
Burlington Northern	248	28	90	120					
Canadian National	256	23	50	255	23	50	1	10	
Canadian Pacific	232	23		232	23		195	23	
Chessie System	116	72	117	84	79	117	1		
Chicago & North Western	55	23	41	2	23	41		22	35
Chicago, Milwaukee, St. Paul & Pacific	19	6	15	7			3		
Conrail	282	25	85	746	25	85	51	8	14
Delaware & Hudson	8		10	8		10	1		4
Denver & Rio Grande Western	33	5	10	381	24	35	15		
Duluth, Missabe & Iron Range	7			19	2		1		2
Elgin, Joliet & Eastern	1			2			1		
Florida East Coast	20			20			22		
Grand Trunk Western	24		2	24		2			
Illinois Central Gulf	93			84			91		
Kansas City Southern	75			82	8	8	37	5	19
Maine Central			7			7			3
Missouri-Kansas-Texas	30	1	5	30	1	5		1	6
Missouri Pacific	161	13	50	169	13	50	2		
Norfolk Southern (NW)	172	1		173	1		172	1	
Norfolk Southern (SOU)	187			256			37		
Quebec, North Shore & Labrador	11			7		17			
Richmond, Fredericksburg & Potomac	10		2	24			1		
Seaboard System	376	12	30	369	76	30	10	1	
Soo	21	2	10	18	2	10	22	2	10
Southern Pacific	287	2		697	2		71	4	
Union Pacific (incl. WP)	173	9	10	154	37	58	3		
Total	264* + 3,100	202* + 257	174* + 548	4,355	351	543	766	77	101

*On-board hotbox detectors in service on various Amfleet equipment

**Includes hot wheel, loose wheel, flat wheel, and oversized load detectors



Conrail hot box detector installation at Harmersville, Pa. with display board readouts. Following highly favorable train crew reactions to its first 11 "talker" installations in 1980-81, Conrail began large-scale applications and currently has more than 450 hot box, hot wheel and dragging equipment detectors with voice readouts, generally providing more complete information on multiple detectors than practical with the limited number of auxiliary indication lights used along with the axle-count display board.

Photo: John S. Murray

pared to supply a complete multi-sensor wayside detection, analysis and reporting package.

• Another microprocessor revolution.

If there was ever a ready-made application crying for the ministrations of a microprocessor, the hotbox scanner is it. At best, only subtle distinctions exist between the heat signature of a bearing that's good for another million miles and one that may be ready to heat up and burn off within the next few miles; analysis going far beyond simply comparing indicated journal temperatures at the ends of the same axle is necessary if the best possible "to alarm or not to alarm" decision, taking into account all available known effects of air temperature, solar heating, wind and so on, is to be made and acted upon in real time while the train is thundering by at speed.

If still not exactly duck soup for the microprocessor, such on-site analyses have rather suddenly become both conceivable and, in comparison to the cost of the scanner optics, quite affordable.

Some fairly high-powered thinking is going into the selection and implementation of alarm criteria, and trade-offs remain: How does discrimination capability which might be derived from a triple analysis of bearing data from the entire side of a 150-car train—which a micro can make in less than second—compare with the benefit of sending an alarm the instant a possible emergency-level signal is established on the basis of a sophisticated one-car/eight-bearing algorithm? At this point, there's room for argument—and the already-exploited capability of today's processors to generate and transmit more than a single level of alarm sometimes may make it possible to have things both ways.

A premise behind establishment of the

FRA's Wayside Detection Research Facility at Pueblo Transportation Test Center in 1978 was that microprocessor integration of the analy-

sis and reporting of multiple sensors could be a good thing if only it were demonstrated to the industry. Funding to complete the planned program ran out, and the WDRF is now inactive; the microprocessor revolution in this area, having generated its own steam, is in effect coming to pass anyway.

• **The instant buggywhip.** When it comes to a sudden shift in technology and the resulting reduction of a substantial product line to buggywhip status, however, the effect of the caboose-off agreement and microprocessor adjuncts on the preferred detector readout really stands out.

As an alternative to the scoreboard display alerting the rear-end crew to the general nature of any defects picked up by the sensors and giving a single axle-count location of the first one detected, the "talker" with its music-box radio playback was first installed by Seaboard in the late 1970's. It not only eliminated a bulky wayside installation but presaged the ultimate cabooseless consist by allowing its message to be picked up by a crew member regardless of his location on the train.

At first based on the somewhat clumsy technology of picking out appropriate messages from a pre-recorded tape, the talker was considerably reduced in size, complexity and cost as soon as microprocessor voice units became available; now that the eventual concentration of crew members on the head end of the train has become a solid bet, choosing a detector read-out method has typically become a matter of deciding whether the radio message to the crew should come via a central analysis and recording office or be generated and transmitted automatically at the detector site; or perhaps—given the message generating, digitizing, classifying and routing capability inherent in the wayside micro-

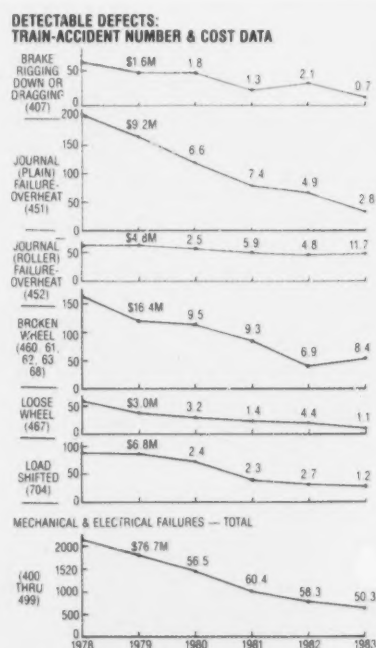
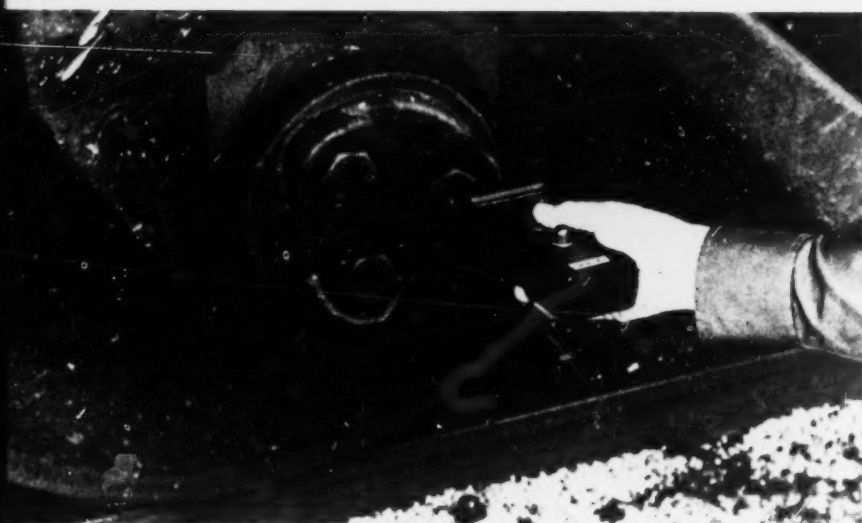


Fig. 1: Number (left axis) and total reportable cost (\$ million) of selected categories of train accidents attributed to classes of defect susceptible to some degree of preventive monitoring or detection. Data from FRA annual Accident-Incident Bulletins, 1978 through 1983; accident-category line numbers in parenthesis.



After a detector senses a problem, the trouble spot must be pinpointed. One device made for that task is the Servoprobe, a hand-held train inspection verifier that counts axles and digitally displays wheel or journal temperatures.

processor—both ways. *Hot* bearing alarms, for example, may be transmitted directly and immediately to the crew; *warm* indications go to central for further analysis.

So, scoreboard-readout sales have dropped essentially to zero. The big end of the detector stick for many railroads for the next few years will be an orderly conversion program to achieve all-talker status, and talker suppliers are—at least proportionally to the number of units involved—as numerous as purveyors of IBM-compatible personal computers.

Typical is Southern Pacific's 1984 program: New installations include two hotbox, four hot wheel and two dragging equipment detectors (all with voice readouts); 140 of its 287 existing HBD's and 368 of 697 DED's are to be converted to talkers.

● **Finding the rascal.** Every railroad with a network of detectors in service has experienced the frustration of stopping a train on the detector's indication of a hotbox or dragger, finding nothing from on-the-ground inspection, and letting the train resume its journey only to have it demonstrate the power of modern technology and Murphy's law by piling up a few miles down the road from the effects of the very trouble that was sensed but not pinpointed. Estimates of what the effectiveness of the inspection process *should* be differ if made at a desk in the office rather than at trackside in the dark in rotten weather; in any case, developing changes in train crew consist and deployment are bound to affect the real-world answer.

Is some sophistication in order? Servo has ready its "Servoprobe" hand-held train inspection verifier which will count axles and read out wheel or journal temperatures on its digital displays. An item that would have to be spread around in quantity to be used effectively over a major railroad, and one that will

remain fairly expensive unless commitments justifying large scale production are made, it has already found favor on some overseas heavy-haul railroads where one unit per train-set can really speed up the process of run-by inspection of a cabooseless unit train halted by a defect indication.

● **On-board detection.** With the best of wayside detectors, some hotbox accidents will still occur when bearing heating starts soon after passing the scanner and progresses to burn-off before the next check point, the remedy is a full-time, on-board detector. While FRA-supported projects to develop and prove such systems for freight service have petered out for lack of funding, routine continuous monitoring of a significant number of passenger train bearings has now become an accomplished fact.

Amtrak's 640 Amfleet I and II cars, many now in service at 120 mph on the Northeast Corridor, have Pioneer III trucks whose inside, rubber-doughnut-enclosed bearings cannot be surveyed by wayside scanners. Following up on a program (*RA*, Nov. 10, 1980, p. 31) to develop a nonproprietary monitoring system, Amtrak has already equipped 264 cars and its AEM-7 electric and F-40PH diesel locomotives hauling them with Safetran-supplied monitoring hardware and has the remaining 376 inside-bearing cars programmed for retrofit.

A green light in the locomotive cab, in communication via a wire in the trainline jumpers with any equipped cars in the consist, verifies sensor circuit integrity and safe bearing temperatures. Any trouble indication extinguishes the green light, activates a beeper in the affected car, and indicates on a local panel the truck in question for temperature-stick (200 deg. F) investigation after the train has been stopped.

● **Beyond the hotbox.** As if to re-emphasize the fact that *any* burned-off-journal accident *can* turn out to be *very* expensive, the reportable damage total for 1983's record low number of such happenings was \$14.5 million dollars—higher than for the considerably larger number of them occurring during any one of the five previous years, as shown in Fig. 1, and close to the \$15.1 million reportable cost for the 409 such accidents racked up a decade earlier in 1970. Overcoming a 292% price index increase over the 13 years to stay below that dollar-damage total in a bad year remains a feat which any detector salesman or railroad C&S officer might like to mention.

Also included in Fig. 1 are numbers and reportable-damage totals for those other major accident causes for which at least the possibility of cost-effective defect detection exists.

As it happens, detectors for at least some aspects of all these causes are in service; dragging equipment detectors (which of course catch other misplaced items besides those brake rigging components that are their main fodder) will continue to lead the field, in numbers if not in cost or sophistication, with over 300 to be installed or upgraded in 1984. An attractive upgrade in this microprocessor era is tying the DED into the hotbox talker's processor so that the crew also gets the axle count of any dragging equipment indication and can check out the situation with less walking and delay.

Receiving spottier acceptance so far are hot-wheel detectors. Some roads such as Canadian Pacific are attacking the problem of thermal wheel abuse and its possibilities for later catastrophic failure by routinely locating one at every HBD/DED site. Partisans of the separately-aimed hot-wheel scanner can cite extensive experience indicating that it typically catches (particularly if located near a yard exit) at least twice as many problems as the HBD—struck brakes, mis-set retainers, unreleased hand brakes and the like—at an add-on cost of less than 20% that of a modern HBD.

Others remain less convinced, suggesting that the augmentation of a hub-scanning hotbox sensor with sophisticated processing which can properly interpret slightly warm readings on four or eight wheels of a car as a brake problem may accomplish much the same purpose less expensively.

Also fairly widespread, with over 200 installations reported in service now and a few more expected each year, are outsize-load ("high-wide") detectors. Intercepting both misrouted—statistically a very minor problem—and shifted loads before they impact overhead or wayside obstructions with at least embarrassing and assuredly expensive consequences, detector configurations tend to be specific to the particular site. As a result, the total number of installations has sometimes seemed to be little larger than the number of suppliers (a majority of them railroad signal departments rolling their own), and some

"commercial" systems have gone off the market for lack of volume.

Simple in principle and operation, loose-wheel detectors in which electrical contact between a wheel which has slipped into narrow gauge completes an electrical circuit with a spring-loaded sensor bar (Safetran continues to supply the veteran "Rails" device) are primarily effective at yard speeds or slightly above. Some 300 installations are in service, but on only 9 railroads—notably, FEC, ICG and NW. With the practicability of combining their output with other sensors at a site, however, several additional roads expect to install some within the next few years.

• **Train-dynamics monitoring.** In the face of diminished R&D funding, FRA has continued limited support for a task exploring the use of track wheel force measurements to detect such potentially critical items as unreleased handbrakes and L/V force ratios approaching derailment levels. Several possibilities are at least theoretically promising, although reliably measuring and analyzing these second-order forces day in and day out, outdoors, in the face of the railroad mechanical and electrical environment remains technically challenging with or without a microprocessor.

Meanwhile, a significant milestone in putting such instrumentation-type technology to work has been passed with the installation of Amtrak's "Kips Machine" at Edgewood, Md. Officially labeled a wheel impact load detector, the installation has four strain gauges on the rail web measuring forces generated by 10-inch segments of the circumference of passing wheels. Microprocessors digitize the resulting signals and transmit calculated wheel input forces exceeding a threshold (currently 60,000 pounds—60 kips) by phone circuits to printers in Washington and Philadelphia. Indentifiable to the specific axle responsible, excessive loads are cause for shopping of an offending car.

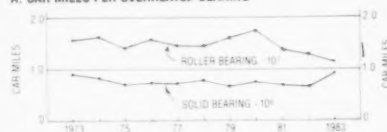
Specific cause for the investigation (with Battelle Columbus Labs, which also developed the detector system) leading to this installation was extensive rail-seat cracking—troublesome though not life-threatening—occurring in concrete ties under the Corridor's mixed heavy freight and high speed passenger traffic. Primary culprit? The combination of high speed and a peculiar type of out-of-round wheel developing on some Amfleet I and Heritage Fleet (rebuilt pre-Amtrak) cars. Not "flats" in the usual sense, these wheel defects are not readily visible to a car inspector but can generate rail-seat forces greater than more heavily loaded flat wheels on freights at their speeds. With the KIPS machine and its successors in service, such dogs will get no more than one bite at the right-of-way.

• **Identifying broken wheels.** Broken wheels—failures in flange, rim, plate or hub or thermal cracking—remain a costly problem, in some years exceeding heat-broken journals in aggregate reportable damage, as a look at Fig. 1 will show. A cooperative FRA-

The hotbox story: 1973-1983

As a continuing major source of damage, delays and expense despite the phasing in of roller bearings and the ten-fold improvement in solid-bearing performance achieved by the elimination of loose waste packing in favor of journal pad lubricators in the late 1950's, overheated journals are tracked by special report to the AAR's Operations and Maintenance Department. Results go quarterly to chief mechanical officers of the member U.S. and Canadian roads; historical summaries for all years from 1973 on are comparable with data currently being collected.

A. CAR MILES PER OVERHEATED BEARING



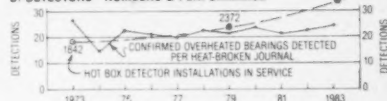
Fleetwide performance levels for both roller and solid bearings have remained generally static during the period. Mileage per hotbox for roller bearings has fluctuated between 12 and 24 times that for solid bearings; for 1983, it was near the bottom end of that range as performance of the remaining solid-bearing cars improved considerably.

B. CAR MILEAGE BY BEARING TYPE



The percentage of total miles run by roller-bearing cars has increased steadily, introduction of roller bearings via new-car installations in heavier-traffic periods being matched to some degree by increased rates of retirement or storage of older solid-bearing cars when traffic is lower.

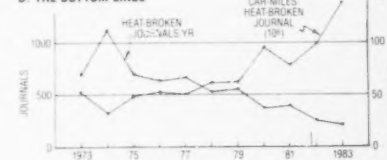
C. DETECTORS - NUMBERS & PERFORMANCE



Since the introduction of infra-red journal bearing scanning in 1956 there has been an accelerating rate of detector development and installation which, with the concentration of traffic on fewer miles of main track, has resulted in better scanning of train bearings at increasingly frequent intervals. However, probably primarily because a roller bearing that does run hot tends to progress to axle failure more rapidly, the overall ratio of detected hotboxes to heat-broken journals has improved only marginally as the percentage of solid bearings has decreased in recent years. Twenty-four hot bearings were detected in 1983 for every heat-broken (undetected) journal.

Detectors-in-service data for 1972 and 1980 are from surveys by Committee F of the AAR Communication & Signal Division; 1983 data were collected by *Railway Age*.

D. THE BOTTOM LINES



Net result has been a fairly steady decrease in the number of failures in service as solid-bearing car-miles have decreased by 75%; overall, car-miles per heat-broken journal reached a new high of 140 million in 1983, more than double that of the early 1970's.

AAR journal bearing performance statistics are not directly comparable with U.S. FRA figures for corresponding failures because they represent a somewhat different car fleet (including Canadian roads) and failures reported are not subject to the reportable-damage threshold applicable to accident data.

AAR program, its \$3.2 million of Federal funding this year representing the agency's principal R&D commitment, continues to seek better ways for identifying the wounded wheels before it's too late.

One facet of the program monitors progress of the numerous parties searching worldwide for that particular Holy Grail that has been attracting metallurgists, physicists and mechanical engineers for many, many decades: a nondestructive procedure capable of determining the state of residual stress.

The other major prong of the offensive is a

brute-force approach toward identifying those particular forms and degrees of thermal abuse which do and do not result in hazardously weakened wheels. A monster dynamometer formerly located in U.S. Steel's laboratories has been acquired and moved to the AAR Technical Center in Chicago. Now situated so that wheel-abuse tests can be routinely carried to destruction, it is hoped that this machine may represent the key but previously-unexploited weapon permitting a more realistic, extensive and ultimately fruitful assault on the problem. ■

First quarter figures of calendar year 1984

(Dollar figures are stated in thousands, i.e., with last three digits omitted)

		Operating revenues				Operating expenses				Income after fixed charges				Net Ry. operating income	
		Freight		Other		Total		Total		Total		Total		Total	
		1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983
Amtrak	3 mos.	—	159,405	159,405	146,953	66,820	38,687	29,252	90,446	90,204	19,926	386,200	341,383	242,27	232,30
Atchafalaya	3 mos.	572,697	9,002	581,699	485,920	85,203	77,281	14,680	141,785	123,710	23,677	533,077	483,817	91,64	99,56
Baltimore & Ohio	3 mos.	254,990	10,368	265,358	196,069	44,992	33,240	9,849	58,496	54,375	7,230	251,567	201,812	94,80	102,32
Bessemer & Lake Erie	3 mos.	11,363	1,698	13,061	10,302	3,643	2,804	1,288	1,763	1,976	1,074	15,610	15,679	119,51	152,19
Boston & Maine	3 mos.	29,781	1,400	31,181	27,495	4,083	5,210	181	9,492	8,438	321	29,802	29,882	95,57	108,68
Butting Northern	3 mos.	1,100,989	23,029	1,124,018	993,316	151,258	154,031	37,061	197,945	178,985	16,231	902,257	842,840	80,27	84,85
Chesapeake & Ohio	3 mos.	241,814	8,113	249,927	210,935	37,465	28,425	8,034	58,255	50,363	3,257	230,233	195,386	92,86	92,82
Chicago & North Western	3 mos.	206,796	25,808	232,604	196,931	37,261	32,563	5,957	56,930	49,126	4,482	222,974	192,757	95,85	97,88
Chicago Milwaukee St Paul & Pac	3 mos.	100,993	3,659	104,652	86,977	19,665	13,304	5,908	30,960	23,988	2,882	104,172	83,420	99,54	95,91
Conrail	3 mos.	811,043	29,661	840,704	718,014	131,979	120,059	22,430	198,468	189,546	35,972	755,881	701,296	89,91	—97,67
Delaware & Hudson	3 mos.	27,741	2,850	30,591	23,983	4,943	4,502	35	9,420	7,813	434	31,829	27,421	104,04	114,33
Denver & Rio Grande Western	3 mos.	86,623	1,592	88,215	69,684	13,943	9,319	2,756	16,994	14,181	3,106	80,778	63,670	91,56	91,36
Duluth, Missabe & Iron Range	3 mos.	14,321	316	14,637	9,410	6,582	4,780	1,492	2,764	2,241	794	18,705	14,102	127,79	149,86
Egin, Joliet & Eastern	3 mos.	18,345	9,212	27,557	21,769	3,110	2,468	684	3,201	2,734	1,879	22,866	19,289	82,97	88,60
Florida East Coast	3 mos.	30,779	395	31,174	25,619	4,364	5,006	1,132	5,372	3,872	1,122	22,485	19,691	72,12	76,86
Grand Trunk Western	3 mos.	80,316	4,237	84,553	52,102	10,142	8,422	1,747	19,481	12,216	1,598	83,512	56,891	98,76	109,19
Illinois Central Gulf	3 mos.	233,499	20,923	254,422	223,703	29,982	23,701	11,513	72,480	70,949	5,042	236,890	216,773	93,10	96,90
Kansas City Southern	3 mos.	78,695	3,668	82,363	74,933	12,067	13,209	3,676	20,506	18,306	5,043	71,194	67,899	86,47	90,61
Missouri-Kansas-Texas	3 mos.	DATA NOT AVAILABLE AT PRESS TIME													
Missouri Pacific	3 mos.	431,745	11,368	443,113	414,005	60,462	61,320	11,934	96,583	100,992	18,215	391,869	373,972	88,43	90,33
Norfolk & Western	3 mos.	422,014	15,870	437,884	347,418	80,057	74,492	10,512	82,723	71,469	13,271	361,126	330,868	82,47	95,23
Pittsburgh & Lake Erie	3 mos.	11,348	429	11,777	9,482	1,693	1,861	245	4,173	5,027	360	13,960	15,543	118,53	163,92
St. Louis Southwestern	3 mos.	108,778	1,426	110,204	84,112	14,388	10,816	4,199	28,303	20,602	5,575	97,983	77,937	88,11	92,65
Seaboard System	3 mos.	892,909	14,720	907,629	606,574	82,340	86,836	15,517	166,126	154,322	15,432	590,304	557,013	83,40	91,80
Soo Line	3 mos.	81,668	1,867	83,535	66,685	13,648	11,045	2,826	19,384	15,934	2,034	76,076	62,938	91,07	94,38
Southern	3 mos.	432,559	10,176	442,735	383,205	61,768	49,035	16,952	90,300	79,403	18,568	360,231	323,343	81,36	84,37
Southern Pacific	3 mos.	529,977	17,452	547,429	462,498	62,044	84,061	20,788	163,076	130,003	21,051	549,705	500,181	100,41	108,14
Union Pacific	3 mos.	496,455	5,978	502,433	445,090	75,162	59,551	16,833	112,315	93,860	23,616	456,380	399,223	90,83	89,69
Western Pacific	3 mos.	38,527	677	39,204	40,811	7,454	6,664	729	8,541	10,768	1,828	43,643	46,913	111,32	114,95

Source: Interstate Commerce Commission

NOTE

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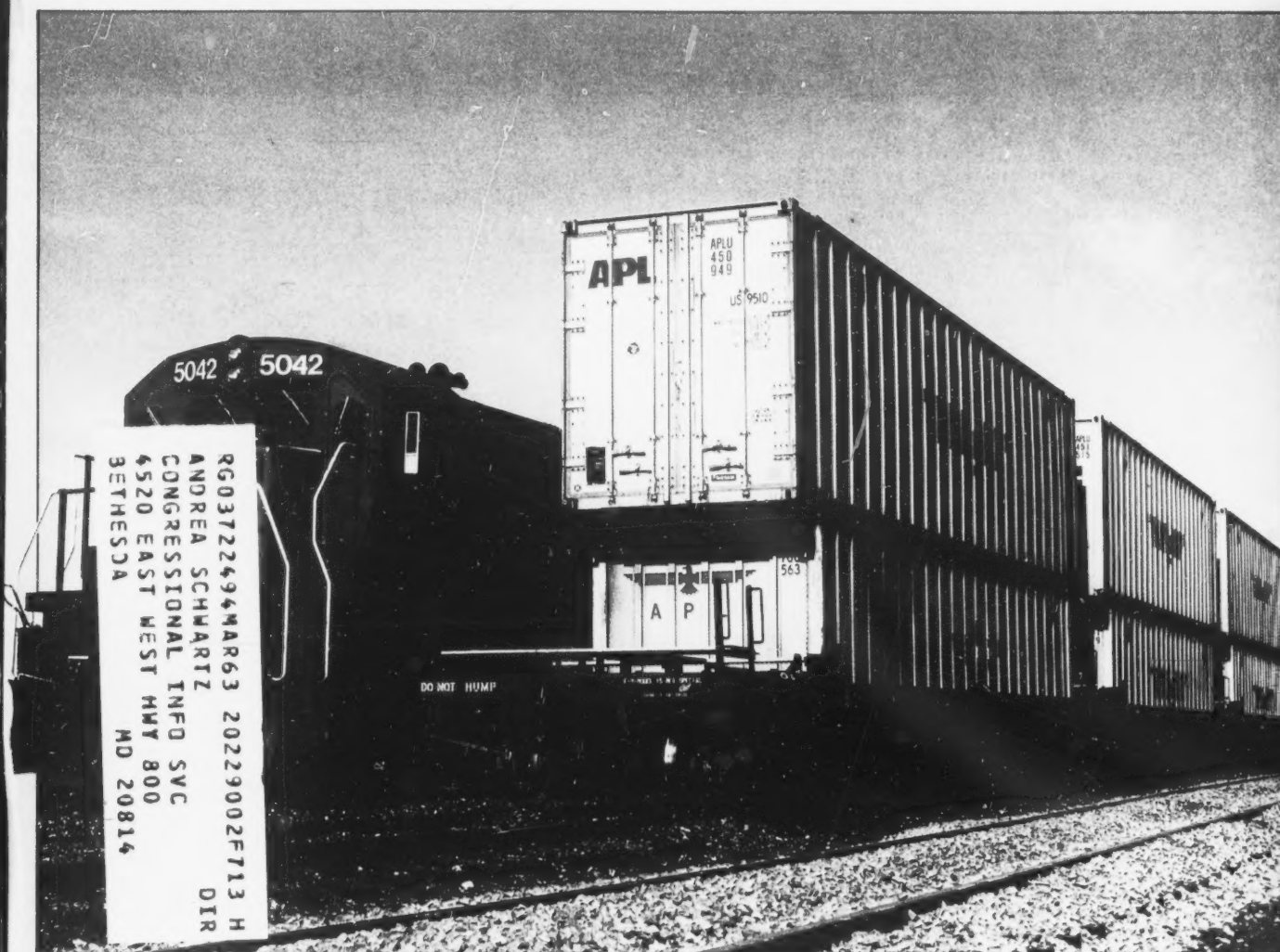
August 1984

A slow order for
Los Angeles Metrorail?

RAILWAY AGE

...for the new age of railways

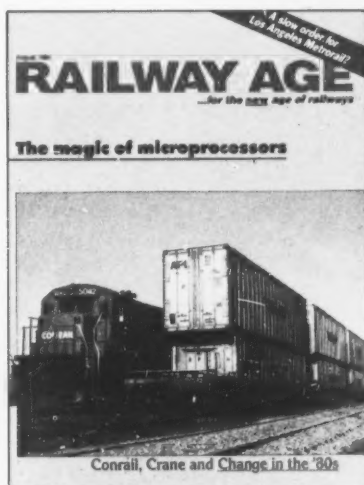
The magic of microprocessors



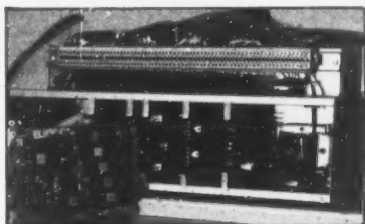
Conrail, Crane and Change in the '80s

RAILWAY AGE

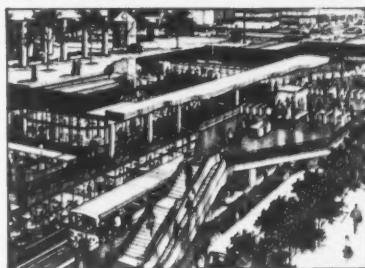
...for the new age of railways



Cover: APL double-stack container cars on Conrail. Photo by Roy Blanchard. Page 33.



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L. Stanley Crane has presided over the railroad turnaround of the century—but he's far from complacent, seeing productivity as the next big challenge.

39 Micro magic—and Advanced Train Control

The microprocessor era holds exciting possibilities for the railroads—not the least of which is a modular, industry-wide-compatible Advanced Train Control System.

62 ICG cuts back and shapes up

After trimming 2,000 miles of line, and investing \$1 billion in what remains, ICG is close to its goal of becoming a sleek expressway between Chicago and the Gulf.

67 Missouri Pacific's 21st century shop

At North Little Rock, Ark., MP has built a \$40-million locomotive facility designed to meet the expanding needs of Union Pacific System into the next century.

72 A slow order for Los Angeles

A moment Los Angeles has worked toward for 30 years—ground-breaking for a subway—will be delayed as federal funding problems are tackled.

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Inside

The Conrail/Crane factor

Wall Street regards L. Stanley Crane as something of a wizard—a management Merlin who transformed a red-ink property into a coveted blue chip. His fellow railroaders know Crane as a shrewd and tough manager who runs his business well because he makes it his business to know every aspect of it. Crane sees himself, he told *Railway Age* the other day, as "just a nuts and bolts railroader." If he has any ability as a manager, he said, it has come from his good fortune in finding the right people at the right place at the right time—which (he added) is just what he found at Conrail. "The job of the chief executive officer," said Crane, "is to wave his hands when he sees something going wrong, get someone pointed in the right direction, and then get out of his way and let him do it."

When *Railway Age* asked Crane to address the broad question of "Change in the '80s"—the subject of a year-long series in this magazine—he protested that he was "not really very good at that kind of highfalutin' talk."

But in a taped exchange with the editor and the publisher of *Railway Age*, Conrail's chairman and CEO came across not only as a nuts and bolts railroader (with a particular passion for good track, well and inexpensively maintained) but as a man singularly well equipped to comment on some of the more "highfalutin" aspects of the changing railroad scene—among them, politics and productivity. A transcript of the interview starts on p. 33.

Showtime—in Boston, Chicago, Washington

The transportation business is booming, and the carriers—freight and passenger—are in a buying mood. So it's no surprise that suppliers have been signing up in record numbers for four major equipment shows that will take place in the next couple of months. First on tap (Aug. 19-22) are exhibits of the Railway System Suppliers, which are being mounted in connection with the AAR's C&S Division meeting in Boston. In July, RSS had already exceeded its goal of 110 sold exhibit spaces. Another sellout, by all early indications, will be RAILEXPO '84, which the Railway Supply Association will stage in Chicago (Sept. 22-26) concurrently with meetings of the Coordinated Associations. That will be followed by the American Public Transit Association's International Transit Expo '84 in Washington (Sept. 30-Oct. 4), which will be overlapped by exhibits that U.S. and foreign suppliers will put together for the Pan American Railway Congress in Arlington, Va. (Oct. 3-9).

Railway Age will be present at all of these, with extra copies of the August and September issues, respectively, available for convention delegates.



LUTHER S. MILLER

Market Outlook

Equipment

California DOT: Placed a \$23-million order with the Electro-Motive Division of General Motors for 18 new diesel-electric locomotives. The units are scheduled for delivery in first-quarter 1985, when Caltrans is also to receive the first shipment of 63 commuter cars ordered from Sumitomo.

CP Rail: Placed a \$7-million order with National Steel Car to equip 100 tri-level cars with fully enclosed racks.

Conrail: Is building 250 52-foot, 100-ton gondola cars, for scrap metal shipments, at its Hollidaysburg, Pa., shop. The order, estimated to cost \$9.6 million, is to be completed late in November.

Seaboard System: Will refurbish up to 1,400 80-ton coal hopper cars, at a cost of around \$8,500 per car, at its South Louisville shops.

Trailer Train: Ordered 75 Impack cars from Itel. This follows an earlier order for 20 cars which TT placed with Itel last year. The cars are built for Itel by FMC's Marine & Rail Equipment Division.

Wisconsin Power & Light: Ordered 127 Coalporter cars from Bethlehem Steel, which will build an additional eight cars as "tack-on" orders for a total production run of 135 cars. Bethlehem recently completed production of 397 Coalporters at its Johnstown, Pa., plant.

Facilities

GO Transit: Awarded a \$381,000 (Canadian) contract to RMS Industrial Controls of Mississauga for fare collection equipment (manufactured by Associated Electronic Services of Perth, Australia) to be tested on the Milton rail line.

Greater Cleveland Rapid Transit Authority: Union Switch & Signal Division of American Standard is the apparent low bidder, at \$3.2 million, for supply of a computer-based traffic control center for GCRTA.

Freight cars

	DELIVERED		May 1984	Six months	
	1984	1983		1984	1983
Built new by carbuilders	1,771	338	755	4,898	2,104
Built new in RR shops	0	0	0	0	200
Built new—total	1,771	338	755	4,898	2,304
Rebuilt	0	0	0	0	0
TOTAL DELIVERED	1,771	338	755	4,898	2,304

ORDERED					
To be built new by carbuilders	2,744	150	1,301	10,189	2,566
To be built new in RR shops	250	0	0	250	3
To be built new—total	2,994	150	1,301	10,439	2,569
To be rebuilt	0	0	0	0	100
TOTAL ORDERED	2,994	150	1,301	10,439	2,669

ON ORDER AND UNDELIVERED					
	July 1		June 1 1984	Average Backlog	
	1984	1983		1984	1983
To be built new by carbuilders	7,017	4,556	5,723	6,435	4,289
To be built new in RR shops	250	3	0	42	45
To be built new—total	7,267	4,559	5,723	6,477	4,334
To be rebuilt	0	100	0	0	33
TOTAL ON ORDER	7,267	4,659	5,723	6,477	4,367

Source: American Railway Car Institute

Note: June 1984 figures include estimated tank car orders for April, May and June

Locomotives (new and rebuilt)

DELIVERED			BACKLOG		
	1984	1983		1984	1983
May	16	22	June 1	229	127
April	39	28	May 1	249	127
Five months	131	112	Average	147	87

Source: Transportation Div., AAR

Estimated ownership—all revenue freight cars

June 1, 1984 vs. June 1, 1983

		Box	Covered Hoppers	Gondola	Hopper	Flat	Refg.	All Others	TOTAL
Class I RRs	1984	260,496	162,196	126,646	278,204	84,350	52,239	21,420	985,551
	1983	279,267	164,282	130,842	289,300	84,623	55,227	22,720	1,026,261
Class II & S&T Cos.*	1984	48,284	9,856	10,128	11,948	4,745	3,244	3,397	91,632
	1983	50,396	9,532	10,698	11,178	5,092	3,371	2,966	93,233
Railbox- Railgon	1984	15,072		3,997					19,069
	1983	15,533		3,998					19,531
RRO&C** Refgs.	1984						5,911		5,911
	1983						4,924		4,924
Private	1984	543	125,584	28,027	22,021	53,349	1,196	183,656	414,376
	1983	420	128,822	27,740	21,278	54,021	2,383	185,046	419,710
GRAND TOTAL	1984	324,395	297,666	168,798	312,173	142,444	62,590	208,473	1,516,539
	1983	345,616	302,636	173,278	321,756	143,736	65,905	210,732	1,563,659

*Class II railroads and switching terminal companies.

**Railroad owned and controlled refrigerator car lines.

Source: Transportation Div., AAR.

Market Indicators

Key economic indicators of railroad traffic, 1983-1985E(a)

	1983	1984E					1985E				
		1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Year	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Year
Gross National Product, billions Constant (1972) dollars	1,535.3	1,606.0	1,618.0	1,638.0	1,657.0	1,630.0	1,675.0	1,686.0	1,702.0	1,713.0	1,694.0
% increase											
Year-over-year	3.4%	7.8%	6.1%	5.4%	5.4%	6.2%	4.3%	4.2%	3.9%	3.4%	3.9%
From previous quarter		8.8	3.0	5.1	4.5	—	4.5	3.0	3.8	2.7	—
Industrial Production Index (1967 = 100)	147.6	159.8	164.0	166.0	168.0	164.0	170.0	172.0	174.0	175.0	173.0
% increase											
Year-over-year	6.4%	15.4%	13.5%	9.4%	8.0%	11.1%	6.4%	4.9%	4.8%	4.2%	5.5%
From previous quarter		11.1	10.5	4.9	4.8	—	4.8	4.7	4.7	2.3	—
Auto sales, million units sold in United States	9.2	10.6	10.2	10.5	11.1	10.6	10.6	10.4	11.0	11.2	10.8
% increase											
Year-over-year	15.5%	26.2%	10.9%	12.9%	12.1%	15.2%	—	2.0%	4.8%	0.9%	1.9%
From previous quarter		28.3	(15.1)	11.8	22.9	—	(18.0)	(7.5)	23.1	7.3	—
Housing starts (private), millions	1.70	1.96	1.90	1.80	1.80	1.87	1.70	1.60	1.70	1.70	1.68
% increase											
Year-over-year	60.4%	19.5%	12.4%	1.1%	5.9%	9.5%	(13.3)%	(15.8)%	(5.6)%	(5.6)%	(10.2)%
From previous quarter		61.2	(12.2)	(21.1)	—	—	(22.2)	(23.5)	25.0	—	—
Corporate profits											
% increase											
Year-over-year	13.5%	37.2%	17.9%	13.1%	18.3%	20.7%	18.5%	20.7%	14.7%	14.8%	16.5%

(a) As forecast by the Goldman Sachs Economic Research Group. All data is seasonally adjusted and growth rates for successive quarters are seasonally-adjusted annual rates of change.

R-Reported

Source: Goldman Sachs Research

Revenue freight carloadings

Commodity	July 14 week	% change from 1983	July 7 week	% change from 1983	June 30 week	% change from 1983	June 23 week	% change from 1983
Grain	28,794	(4.4)	24,469	(11.9)	27,225	13.9	24,767	(2.2)
Other farm products	3,475	(25.0)	3,359	(11.9)	3,763	(13.6)	3,744	(8.1)
Metallic ores	18,613	(11.7)	17,007	(11.8)	18,029	(18.4)	20,569	(7.7)
Coal	112,976	21.6	85,494	38.6	112,418	46.7	125,966	20.0
Crushed stone, gravel and sand	12,706	12.3	11,230	27.8	13,586	25.8	12,642	13.4
Nonmetallic minerals	13,271	15.7	11,238	16.1	12,414	8.5	11,823	0.1
Grain mill products	9,772	(12.9)	8,871	(7.5)	10,108	(9.6)	10,270	(10.2)
Food and kindred products	10,626	(5.4)	9,262	0.7	11,257	(2.0)	11,184	1.1
Primary forest products	13,452	(10.4)	9,504	(7.2)	14,044	6.3	14,129	(1.2)
Lumber and wood products (except furniture)	6,753	(3.6)	4,991	1.9	7,815	(2.7)	7,424	(4.3)
Pulp, paper and allied products	13,959	(1.9)	13,137	11.5	15,516	2.0	15,181	(2.9)
Chemicals and allied products	23,056	9.6	19,812	12.9	24,014	3.6	23,332	8.2
Petroleum products	4,870	4.4	4,093	4.8	4,842	0.7	4,945	3.0
Stone, clay and glass products	11,531	(0.2)	10,157	6.9	11,941	13.3	11,522	8.5
Coke	5,344	(7.3)	5,327	6.0	5,402	(5.1)	5,375	(0.7)
Metals and products	8,834	13.6	7,803	30.6	10,557	17.5	9,888	24.5
Motor vehicles and equipment	15,830	9.2	13,819	19.3	19,024	11.9	21,007	15.2
Waste and scrap materials	8,919	10.8	6,967	20.3	9,655	25.5	10,107	23.0
Forwarder and shipper assn. traffic	7,003	(8.7)	6,167	(5.4)	7,805	(10.1)	7,182	(13.9)
All other carloads	55,584	14.3	50,555	24.9	60,938	14.1	58,207	12.3
LCL traffic	164	(23.0)	182	(11.7)	217	(22.8)	221	(25.1)
Total Cars Loaded	385,532	7.1	323,444	14.2	400,570	14.9	409,485	8.6

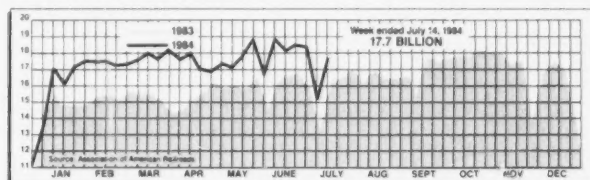
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
28 weeks	495.9	428.8	15.6

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers/containers 1984	% increase from 1983
June 16	50,426	8.4	88,486	9.7
June 23	52,104	10.9	87,578	6.7
June 30	53,831	11.6	93,842	12.3
July 7	44,757	20.9	73,941	16.0
Cumulative total, 27 weeks	1,359,084	17.2	2,342,275	17.1

Rail freight traffic trends

Billion ton miles (Estimated)



NOTE

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September 1984

Light rail
lights up the West

RAILWAY AGE

...for the new age of railways

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CHANGE in the equipment fleet

Rail: The point of the pyramid

Big pesos for Mexico's railroads

RAILWAY AGE

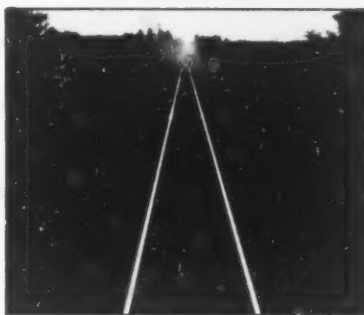
...for the new age of railways



Cover: Posterized photo by Bruce Harmon of FMC.



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As the equipment fleet is refined and reconfigured to meet rising productivity demands, whole new concepts are appearing on the drawing boards.

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Rail: The point of the pyramid

Chief engineers continue their world-wide search for clean, straight, weldable rail with enhanced reliability and prolonged life.

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Solar power's sunny future

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The five toughest questions

What do you say when a tricky question is tossed at you from a hostile audience? A man who has been there offers some specific answers.

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The new, de la Madrid administration has pledged a multi-billion-dollar investment in railroads in addition to many projects already under way.

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Now observing its 75th anniversary, the Railway Educational Bureau at Omaha has switched emphasis from apprentice-training to skills-improvement.

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Light rail lights up the West

San Francisco and San Diego showed the way, and now four other cities have climbed onto the light-rail bandwagon; all hope to have trains running by 1988.

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Spend now, get your grant later

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Inside

RAILEXPO: A show of confidence

RAILEXPO '84 will not be the biggest railroad show Chicago has ever seen. The all-time champion of such displays of railroad muscle and technological ingenuity was the American Railway Progress Exposition of 1963. In the autumn of that year, an astounding 40,000 people (and that was only the official registration) trooped past the exhibits of more than 350 vendors at McCormick Place and (if they found the time) attended the sessions of 24 separate railroad organizations that were meeting concurrently in Chicago.

But if RAILEXPO '84 won't be the biggest of them all, it may well be the bravest—and, qualitatively, perhaps the best.

The bravest—because the 150-odd exhibitors who have booked space at this first Railway Supply Association show since 1979 have not, for the most part, experienced the great comeback from the Great Recession that their railroad customers have experienced; their participation is more an act of faith than evidence of present prosperity.

The best—because the equipment to be shown at RAILEXPO '84 has been custom-crafted for the kind of high-productivity railroading that was scarcely dreamed of 20 years ago. Diesel fuel no longer costs nine cents a gallon—and the fuel-efficient, microprocessor-controlled locomotives that EMD and GE are showing this year reflect that sobering fact. In freight-car design, such considerations as weight and wind drag have become enormously important; the response of carbuilders and component suppliers to these railroad concerns will be evident in the new generation of equipment on display at RAILEXPO.

RAILEXPO participants will be demonstrating not only their products and their services, but also their support of—and confidence in—the future of railroading.

Chicago, then and now

In 1963, James M. Symes stepped down as chairman of the Pennsylvania Railroad with the pronouncement that a new era was at hand: "What we have so long advocated had to come along. Mergers, elimination of featherbedding, tax relief, more freedom in meeting price competition....We're making real progress now." His optimism, though premature, was justified.

If there are fewer railroaders at Chicago this year than in '63, they will be smarter—because they have had to learn to be. If there is less equipment, it will be better—because it has to be. And if the optimism is more restrained, it will be more solidly based—because most of those things Jim Symes talked about have at last come to pass.



LUTHER S. MILLER

Market Outlook

Equipment

CN Rail: Ordered 101 track motor cars valued at more than \$1 million from Beaver Car Canada, Fairmont Railway Motors, and the Railcar Division of GSP Management.

Kansas City Southern: Ordered 110 100-ton coal cars from Thrall for delivery in this year's third and fourth quarters.

Facilities

BRAE Corp.: Will begin production this month at a new trailer manufacturing facility at Stoughton, Wis. With completion of the new plant, BRAE's trailer production capacity will rise from 2,000 to 6,000 units per year.

Greater Cleveland Regional Transit Authority: Will use part of a \$30.4-million UMTA grant to upgrade the heavy rail line between Union Terminal and Hopkins International Airport.

New York MTA: Is soliciting bids for construction, engineering, and major procurement contracts valued at approximately \$1 billion, according to the July-December 1984 edition of "An Eye on the Future," which MTA publishes periodically in an effort to attract a wide spectrum of bidders. Now in the third year of an \$8.5-billion capital improvement program involving the New York City Transit Authority, Long Island Rail Road, and Metro-North Commuter Railroad, MTA has so far obligated approximately \$4 billion.

SAB Harmon Industries Inc.: Has received orders from Chessie System for over \$2 million worth of automatic train control equipment; from CN Rail for over \$500,000 for 60 sets of motion-sensing and constant warning time devices; from BN and Chessie for hotbox detector equipment worth over \$2.6 million; and from Chessie and SP for talking hotbox detector equipment worth over \$2 million.

Freight cars

	DELIVERED		June 1984	Seven months 1984	
	1984	1983		1984	1983
Built new by carbuilders	1,327	260	1,771	6,315	2,364
Built new in RR shops	0	0	0	0	200
Built new—total	1,327	260	1,771	6,315	2,564
Rebuilt	0	29	0	0	29
TOTAL DELIVERED	1,327	289	1,771	6,315	2,593

	ORDERED				
To be built new by carbuilders	607	934	2,744	10,796	3,500
To be built new in RR shops	0	0	250	250	3
To be built new—total	607	934	2,994	11,046	3,503
To be rebuilt	0	0	0	0	100
TOTAL ORDERED	607	934	2,994	11,046	3,603

	ON ORDER AND UNDELIVERED		July 1 1984	Average Backlog	
	Aug. 1 1984	Aug. 1 1983		1984	1983
To be built new by carbuilders	6,571	3,894	7,017	6,454	4,232
To be built new in RR shops	250	3	250	71	39
To be built new—total	6,821	3,897	7,267	6,525	4,271
To be rebuilt	0	71	0	0	39
TOTAL ON ORDER	6,821	3,968	7,267	6,525	4,310

*Increase in Aug. 1, 1984, backlog due to revision in tank car estimates.

Locomotives (new and rebuilt)

DELIVERED	1984	1983	BACKLOG	1984	1983
July	93	11	August 1	159	167
June	60	13	July 1	202	167
May	16	22	June 1	229	127
Seven months	191	125	Average	157	110

Source: Transportation Div., AAR

Estimated ownership—all revenue freight cars

July 1, 1984 vs July 1, 1983									
	Box	Covered Hoppers	Gondola	Hopper	Flat	Refg.	All Others	TOTAL	
Class I RRs	1984 258,643	161,421	125,860	275,259	84,642	51,654	21,341	978,640	
	1983 279,034	164,009	130,271	288,473	84,509	55,043	22,599	1,023,938	
Class II & S&T Cos. *	1984 48,343	9,933	10,136	11,976	4,715	3,244	3,390	91,737	
	1983 50,618	9,581	10,727	11,178	5,100	3,371	3,008	93,583	
Railbox-Railgon	1984 15,074	3,998						19,072	
	1983 15,097	3,998						19,095	
RRO&C**	1984					5,846		5,846	
Refgs.	1983					5,004		5,004	
Private	1984 545	125,787	28,457	22,209	53,605	1,179	183,231	415,013	
	1983 444	128,344	27,776	21,335	53,822	2,331	184,945	418,997	
GRAND TOTAL	1984 322,425	297,141	168,451	309,444	142,962	61,923	207,962	1,510,308	
	1983 345,193	301,934	172,772	320,986	143,431	65,749	210,552	1,560,617	

*Class II railroads and switching terminal companies.

**Railroad owned and controlled refrigerator car lines.

Source: Transportation Div., AAR.

Market Indicators

NCA coal forecast

Although demand for U.S. coal is increasing at a slower rate than was predicted two years ago, a revised National Coal Association forecast indicates continued growth in all markets. The biggest increase is expected to occur in coal exports, which NCA predicts will grow by 72.7% during the next ten years. Consumption by general industry, residential and commercial users is expected to increase 68.4% between now and 1995. And consumption by utilities—the biggest users of coal—is predicted to grow by 24.8%, although NCA expects their share of total consumption to drop from 77% to 72%.

For the short term, however, there remains the threat of a coal strike. The United Mine Workers contract expires Sept. 30.

U.S. Coal Production and Consumption

(excluding anthracite, in millions of tons)

	1995*	1984*	1983	1982	1980	1978	1976	1974
U.S. coal Production	1,121	853	781	834	824	665	679	603
U.S. coal Consumption by:								
Utilities	811	650	624	593	568	480	447	390
Steelmakers	51	46	37	41	67	71	84	90
General industry/ Residential & Commercial	128	76	73	71	64	70	68	73
U.S. coal exports	133	77	77	105	90	40	59	60
Synthetic fuels	5	—	—	—	—	—	—	—
Total demand	1,128	849	811	810	789	621	658	613

*Estimated

Source: National Coal Association

Revenue freight carloadings

Commodity	Aug. 11 week	% change from 1983	Aug. 4 week	% change from 1983	July 28 week	% change from 1983	July 21 week	% change from 1983
Grain	27,378	(7.0)	26,921	(4.5)	25,104	(10.6)	28,194	(5.3)
Other farm products	2,540	(32.0)	2,549	(29.7)	2,943	(30.4)	3,504	(17.5)
Metallic ores	17,440	(4.4)	19,079	21.9	19,666	(3.2)	18,070	(13.5)
Coal	130,809	17.1	129,735	25.8	129,605	20.4	125,767	28.0
Crushed stone, gravel and sand	12,805	12.6	12,612	11.0	13,011	15.4	12,786	12.3
Nonmetallic minerals	12,468	19.9	12,783	4.9	12,891	6.0	11,827	(4.4)
Grain mill products	10,242	(9.9)	10,392	(9.0)	9,805	(13.3)	9,714	(14.2)
Food and kindred products	10,373	(10.3)	10,924	(5.3)	10,606	(9.3)	10,818	(3.6)
Primary forest products	13,480	(5.0)	12,859	(9.4)	14,094	(4.0)	13,460	(10.3)
Lumber and wood products (except furniture)	7,035	2.5	7,312	3.2	7,291	(9.3)	7,002	(1.2)
Pulp, paper and allied products	14,466	(2.2)	14,938	3.0	14,646	(4.0)	14,396	(1.2)
Chemicals and allied products	23,480	2.8	23,732	4.7	23,742	4.3	23,269	14.5
Petroleum products	4,647	(4.0)	4,637	(2.1)	4,884	5.4	4,818	9.8
Stone, clay and glass products	10,884	(4.4)	11,272	3.4	11,222	(1.2)	11,183	1.2
Coke	5,173	(3.4)	5,185	(0.2)	4,752	(8.8)	5,118	(7.3)
Metals and products	7,917	(2.7)	9,018	29.3	9,399	12.2	8,998	15.2
Motor vehicles and equipment	16,488	22.2	16,347	19.5	17,747	18.6	18,286	23.9
Waste and scrap materials	8,604	9.0	8,663	14.1	8,877	11.1	8,929	7.8
Forwarder and shipper assn. traffic	7,237	(9.5)	7,874	1.6	7,354	(10.2)	6,915	(11.6)
All other carloads	58,264	13.5	58,425	14.5	58,495	10.9	57,627	11.7
LCL traffic	122	(59.2)	126	(53.8)	133	(49.4)	134	(37.7)
Total Cars Loaded	401,852	6.5	405,383	11.3	406,267	6.6	400,815	8.9

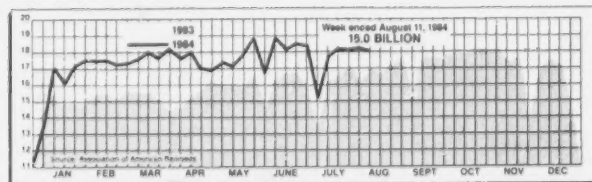
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
32 weeks	568.4	494.2	15.0

Piggyback loadings

Week ended	Cars loaded 1984	% increase from 1983	Trailers/ containers 1984	% increase from 1983
July 14	49,405	12.2	84,076	9.6
July 21	50,748	11.1	87,668	10.2
July 28	51,928	9.6	89,253	9.6
August 4	51,916	13.6	88,640	11.1
Cumulative total, 31 weeks	1,562,995	16.4	2,701,519	16.5

Rail freight traffic trends

Billion ton miles (Estimated)



Rail: The point of the pyramid

The search continues for the best combination of the many possible improvements that will weed out flaws and be most effective in enhancing the steel rail's reliability and life.

By JOHN ARMSTRONG,
Associate Editor

At the tip of the pyramid of tie plate, crosstie, ballast and sub-ballast that must spread out today's typical North American 33,000-pound wheel load to an intensity the roadbed can sustain is the rail itself—or, more pointedly, that "contact patch" of about 1/6th of a square inch between wheel and railhead. Along with the vertical guidance—basically from flanges rubbing on the rail—which makes *trains* possible, the load capacity and low friction attained with such intense loading between hard, elastic elements is responsible for the efficiency and, indeed, the very existence of the whole industry.

Not only must the steel withstand this rolling load, along with a spectrum of dynamic effects ranging up to flat-wheel impacts which can be as high as six times the static load; it must also survive such treatment year after year. Uniquely among industrial technologies, rail transportation routinely strengthens the character of one of its largest capital assets by loading it *beyond* its yield point.

The reason for doing this, of course, is that it pays—not without controversy, and not without abundant problems which have been kept in bounds only with a century's worth of know-how (empirically- and scientifically-generated) brought to bear through massive investment in production, quality control, handling and maintenance facilities.

• **Even the "plain" is special.** As anyone who has tried to hacksaw through an old piece of rail to create a set of fireplace andirons is well aware, rail steel is *hard*. More than 90% of the approximately 34 million tons of steel in place in the 160,000 first-track miles making up the U.S. line-haul network is "plain carbon" by designation. In composition it

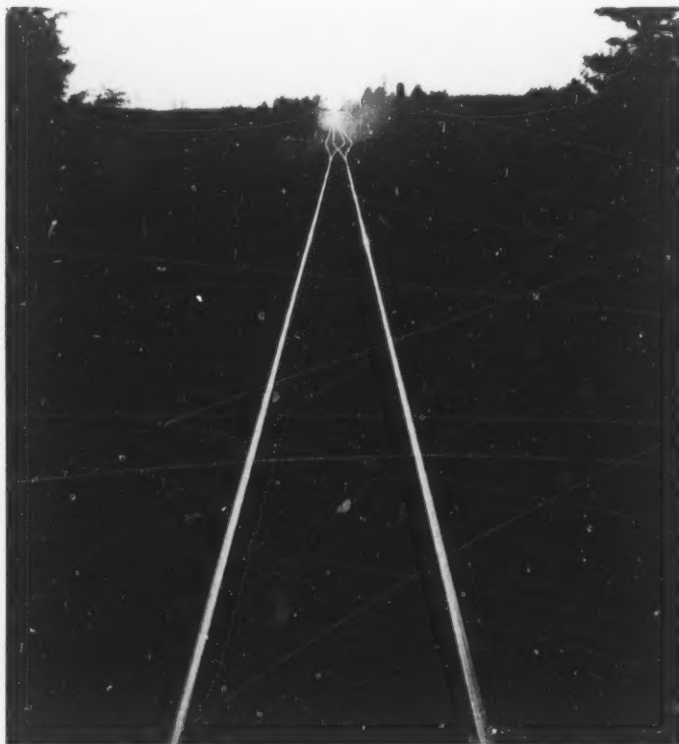


Photo: Roy Blanchard

actually bears little resemblance to the carbon steel making up the vast bulk of the bridges, building skeletons, concrete reinforcing bars, machinery, "tin" cans, household appliances and automobiles (and freight cars, too) on which so much of today's quality of life hinges.

The 0.70% to 0.80% carbon content typical of rail of main-line weight puts it within the classification of *hard* steels, usable only when temperature-time history in manufacture has been precisely controlled to result in a microstructure with the right combination of hardness and toughness for the intended use. Only tool and spring steels are of higher carbon content; tonnage production of these typically is only about a tenth that of rail.

Also found essential from the earliest days of large-scale steelmaking (by observing that the product made from iron lacking these elements consistently resembled Swiss cheese as

a result of violent evolution of oxygen during the solidification process) were manganese and silicon; Mn and Si contents up to about 1.0% and 0.3% respectively are typical of "plain" carbon rail. Also crucial to reliable and workable steel are respective phosphorus and sulfur contents below 0.035% and 0.04%.

Though something as long established as the iron-carbon phase diagram may tend to be considered low-tech these days, rather basic AAR-sponsored metallographic studies at Carnegie-Mellon since the advent of scanning electron microscopy have provided some new and useful answers to old questions. To oversimplify what is still a rather complex situation, the desired microstructure for rail is *pearlite*, grains made up of minute layers of extremely soft pure iron (ferrite) and extremely hard iron carbide (cementite—Fe₃C) with an overall composition

equal to 0.83% C and pearly in appearance. The finer the layering in the pearlite, the harder and stronger, to a limit of perhaps 450 Brinell and 225,000 psi; the finer-grained the steel, the tougher it is at any given level of hardness.

So, all the mill has to do is to produce rail-shaped pieces of steel with a high enough proportion of such microstructure—at least in the critical areas—and all the railroad has to do is join them into tracks and maintain the rail's integrity throughout a lifetime which may extend beyond a half-century.

• **It's not all metal.** Steelmaking by any process involves controlling a melt which at the white heat of 2,800 degrees Fahrenheit avidly interacts with the atmosphere and with every container it contacts. Good steelmaking practice slags off many of the undesirable constituents, combines them into inclusions such as calcium manganese silicates whose

nature is not incompatible with steel toughness, or induces them to collect where they can be cropped off after solidification has largely, for good or ill, determined the heat's chemistry. Inclusions must be controlled, but they can not be eliminated entirely.

Starting with ingot or bloom, the steel must complete a dozen or so passes through the rolls, including hot-sawing into individual-rail segments and cambering so it will end up straight when cool, within the five minutes or so within which it remains within the 2,300- to 1,800-degree upper forging temperature range. Otherwise it may end up full of residual stresses in return for giving the rolling mill a hard time with its excessive stiffness.

The structure and hardness of the steel is determined by its cooling rate on the hot beds as it drops below the 1,500-degree point where recrystallization from the austenite phase (stable at rolling temperatures) to pearlite takes place. Air cooling of carbon rail steel results in the standard hardness of about 255 Brinell with good toughness—as verified for each heat or ingot by chemical analysis, drop testing of a section of rail, and examination of the fractured surface in a notch-and-break test, per AREA specifications of long standing.

Since the 1930s it has been recognized that one melt constituent intolerably detrimental to rail integrity is hydrogen; hydrogen flakes segregating in the rail after rolling lead to internal "shatter cracks" which may grow in service into transverse fissures. Twenty-four hours in cooling boxes starting at no lower than 775 degrees Fahrenheit gives the hydrogen time to diffuse out from the rail, virtually eliminating this particular problem at the cost of a major interruption to the production process.

Numerous other sources of flaws have been tracked down and reduced in one way or another—for example, the central pipe at the top of the ingot likely to show up as a longitudinal split in the web can be properly minimized by hot-topping and cropping or going to continuous casting. The more homogeneous and generally "clean" the steel, the fewer problems (mostly those requiring premature replacement, but some showing up in the accident statistics—see box) in the track over the rail's lifetime.

● **Clean, straight, weldable.** So, one of the things the railroad chief engineer wants is *clean* rail. How do you get cleaner rail? Undoubtedly, the continuous casting process works in that direction by shrouding the steel from the atmosphere during the process, speeding up solidification so there is less opportunity for chemical segregation, and providing a smoother surface for the steel than the typical ingot mold. Inert-gas stirring prior to casting helps homogenize the constituents, float out slag, and control deoxidation. Small doses of powerful deoxidizers such as aluminum are preferred by some steelmakers but shunned by others who feel that the geometry and hardness of the resulting inclusion com-

pounds may result in more rather than fewer effective stress-raisers in the finished rail. The major complication of going to one of the various methods for pouring steel in a vacuum finds favor with all three railmakers in Germany, where the resulting virtual elimination of hydrogen is considered sufficient to allow dispensing with controlled-cooling.

Even with FAST, it can take a long time to see for sure which combinations of the many possible improvements are most effective in enhancing rail reliability and life.

In recent years ultrasonic inspection has become a powerful tool for weeding out specific flaws, in the mill as well as in the welding plant and out on the road. Improving the acoustic coupling, number and look-angle of probes—and automating the process to make inspection of head, web and base of every rail affordable—has been a continuing matter now approaching universality. Suspect areas paint-marked and computer-recorded by the automatic system can then be examined in detail with hand-held probes to determine the fate of any rail in question.

Since it's difficult enough to keep track line and surface up to snuff after the rail is in place, our chief engineer would also like the rail to start out *straight*. Automatic roller-straightening is a lot less labor-intensive and dependent upon operator skill than the time-honored practice of using three-point pressure in a gag-press under a trained eye to remove kinks individually and personally; it can be a sufficiently drastic process, particularly with harder rail, to raise renewed questions regarding the residual-stress state of the rail. Press straightening leaves stressed areas, too, but affecting only short segments of the rail.

Traditionally, the length-of-rail standard in North America practice grew in synch with the length of freight cars readily available to transport it, at least until after the 1920s when it stayed stuck at 39 feet as cars continued to lengthen beyond 40½ feet. Now that there are surplus 85-foot flats and most rail is going to be welded and transported as 1,440-foot cwr strings anyway, the engineer is happier with half as many pieces and half as many welds, so 78-foot rail has a selling point.

Rail steel must now also be *weldable*, both in plant and under the less controllable situations in the field, and preferably without requiring special pre- and post-heating cycles to avoid the development of brittle martensitic components in the microstructure of the heat-affected zones. This requirement has tended to restrict the percentage of manganese usable in developing steels somewhat harder than standard.

● **Harder, too.** Our engineer would also like his rail to last forever, or at least not wear out so fast on curves that he has a continuous battle with the operating department for track time to transpose and relay it. Here, the extra *hardness* of premium rail comes to the fore. A payoff justifying the difference between \$472 a ton for standard and as much as \$200 more for something expected to prove more wear

resistant may look solid in a paper analysis based on experience elsewhere in the industry; but both engineering officers and managements watching their budgets still seem comfortable only after long experience with test sections on their own properties—a conservatism for which ancient roots exist:

Unfortunately, a few years since the result of an investigation on the Pennsylvania Railroad into the wearing qualities of steel rails which showed, or seemed to show, that very hard rails did not wear so well as softer and tougher rails, was taken to indicate that softness itself was a desirable quality in a rail; and the painstaking character of the investigation and the reputation of the road having given these conclusions wide dissemination, manufacturers ... took them as a guide, and between 1880 and 1885 produced rails which have worn away very rapidly so that their life has often been only a year or two under very moderate trunk line traffic.

—A.M. Wellington,

Railway Location, 1887 Ed.

It is by now generally accepted that *harder* rail provides longer life, particularly on curves, to an extent justifying some premium price, and that it can be achieved by various methods as discussed below. Once the determination has been made that what is wanted is cleaner, straighter, harder rail, from whence does this rail come? Over the past 10 years, from overseas.

The steelmaking process, like other capital-intensive, high-tonnage manufacturing, doesn't lend itself to rapid change. Over the 1975-83 period, the proportion of raw carbon and alloy steel produced at the major mills in the United States by the open hearth process has declined from 19.0% to 7.1% while electric steel production has risen from 18.6% to 30.0%, with basic-oxygen steel remaining at 63%. The portion produced by continuous casting has gone from 8.3% to 32.0%. The alloy-steel portion, somewhat surprisingly, declined from 13.1% to 10.8%. Rail steel production throughout the period (Table I) has represented from 0.9% to 1.3% of total domestic raw-steel production.

With the inherent edge in rail steel quality resulting from newer production methods and equipment, however, imported steel—much of it premium—took 35.4% of the U.S. rail market in 1982. Last year, in a total market (domestic production plus imports) down from 771,000 tons to 701,000 tons, imports—in both years roughly equally split between Japanese and European sources—declined to 12.7%.

● **A reshaped rail industry.** Rated annual steel mill capacity of the four rail mills in the U.S. at the time of the last A.I.S.I. survey in 1980 was a whopping 3,546,000 tons. That total doesn't necessarily represent the situation, since some other products may be rolled in rail mills; but since the maximum amount

Rail failures: The danger decreases

In the six years since renewed attention to right-of-way maintenance on U.S. railroads started the FRA train-accident category "Defects in Track, Roadbed and Structures" on its current downward trend, the number chalked up against rail and joint bar defects (Fig. A) has decreased by 72%, a bit more than the overall reduction (67%) in track-caused accidents. Reportable costs have also shown a decreasing tendency, irregular and in the face of inflation less striking in degree.

Accidents from rail and joint bar defects are broken down into 19 specific categories plus that old and seemingly irreducible catchall, "other," which currently accounts for about one quarter of the total damage. Some are so rare that further action to get down to zero is hard to visualize; some, such as derailments attributed to excessively worn rail, rarely happen without warning and are more directly chargeable to deficiencies in inspection than to rail quality. Others remain frequent and costly enough to point toward research which should help further reduce the overall cost of transportation by rail.

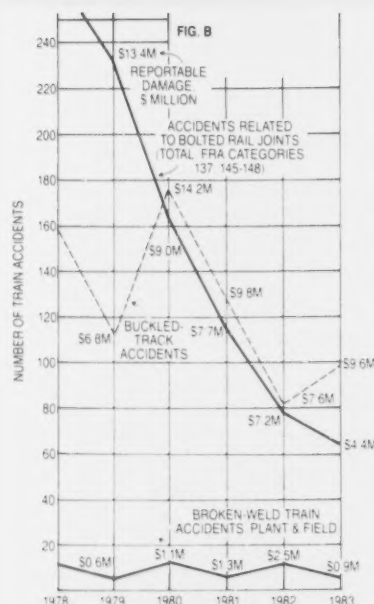
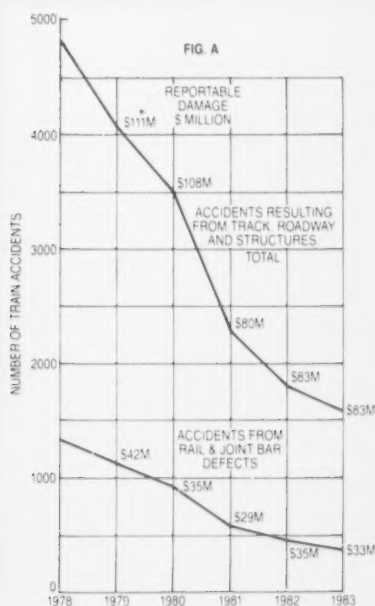
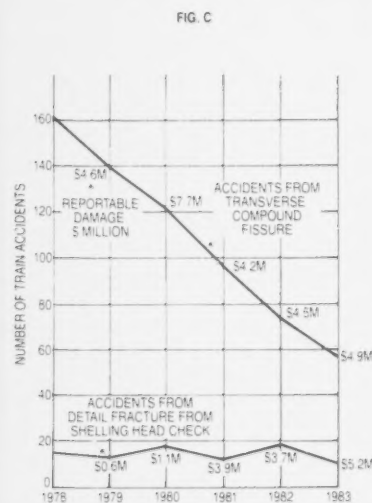


Fig. B aggregates a half-dozen categories associated with rail joints, including head-web separations in the joint region, broken bolts and joint-bar failures. As would be expected during this period when the number of joints is declining as conversions to cwr continue, accident numbers have been cut by 80% and annual costs by \$9 million. Accidents from failures—"pull-aparts"—associated with the welds, plant and field, that replaced the joints are extremely rare. Pull-aparts do occur, but most are detected, by track circuits or otherwise, or do not result in derailment. Accident reduction is not the primary reason for going to cwr, of course, but even in a bad year the balance in the "rail and joint defects" category has been favorable.

The flip side that must be considered, though it's not exclusively associated with cwr, is *track buckling*. The modulus of expansion of steel being immutable, the problem can't be laid on the metallurgist; as the overlay on Fig. B indicates, results to date appear to justify the search for a track-stress monitor to warn of incipient disaster. Current trends set-

ting rail-equilibrium temperatures nearer to the hot end of climatic extremes appear in line with the relative perils of compression and tension in rails and welds.

Remaining expensive are two defect categories (Fig. C) ultimately resulting in complete rail fracture if not detected in time. Although distinguishing between the two is to some extent a matter of judgment and they may not in all cases be correctly reported, in general "transverse/compound fissures" are those originating at a material defect deep within the rail head. Accidents attributed to them have been steadily declining in number, probably to a considerable extent from final retirement of old, fissure-prone rail antedating controlled cooling. "Detail fractures from shelling/head check," on the other hand, start nearer the surface of the rail (often near the gauge corner) where today's heavy axle loads produce high stresses and fatigue. Some of these as they grow under traffic turn downward where they may end up in sudden transverse rail fracture; their number has not been declining and the resulting accidents can be expensive ones. A major thrust of FRA and AAR rail research is directed at isolating, measuring and controlling factors affecting their growth.



of new rail laid in any one of last 30 years was 1,065,000 tons (in 1979), it's apparent that capacity was not exactly tight.

The ticket for a new rail mill—exclusive of the steelmaking capacity to feed it—is \$200 million plus; employment at any plant capable of rolling standard rail in practical quantities, even at today's level of automation, is enough to impact a community heavily. So, you don't stay in or get into the rail business casually.

With U.S. Steel's closing of its rail mills at Gary, Ind., and Fairfield, Ala., and its decision to demolish its South Works at Chicago and leave the market rather than add a \$225-million rail mill at the site (actions which the State of Illinois is fighting in the courts on the basis of tax-break legislation and pollution-control concessions advanced in prospect of mill construction), there are only three active rail mills in the United States.

In an industry whose overall difficulties as one of the old kids on the block have been well publicized, each active mill has some definite claims to fame; in the aggregate, methods of rail steel manufacture prevalent in the U.S. have undergone a major reshaping in a rather short time:

—CF&I Steel's rail plant at Pueblo, Colo., was the first domestic mill to establish capability for rolling rail in lengths up to 8.

feet, significant in these days when most rail is headed immediately for cwr. Both Denver & Rio Grande Western and Burlington Northern have rail welding plants right in Pueblo. Roller-straightened in both plants since 1979 and automatically scanned ultrasonically since 1982, rail from this Crane Co. subsidiary is available in standard, intermediate-hardness (for improved wear resistance on track of moderate curvature) and its trademarked chromium-molybdenum premium ("Cromorail") grades, all of established seniority. CF&I's decision to shut down its coke plant and blast furnaces last December ended basic steel production in Pueblo, so all rail production now comes from scrap melted and processed in the electric furnace.

—Wheeling-Pittsburgh made use of a Federal loan-guarantee program available at the time in adding a \$105-million rail mill to its existing Monessen, Pa., plant. The rail mill went on line in the recession year of 1982—"not exactly the timing we had in mind when construction was started, but it did give

straightened both before and after the quenching and tempering operation.

● **Head-hardening lives on.** Termination of U.S. Steel rail production represents the end of domestic production of head-hardened premium rail. Railroads which have paid the extra for its Curvmaster to extend rail-renewal periods will find head-hardened carbon rail still available, however, and produced by different techniques as well. Nippon Steel head-hardens carbon rail, after straightening, by induction heating and a process it refers to as "slack quenching."

Nippon KK's recently introduced premium rail is also head-hardened with a controlled compressed-air quench, but after flame heating; a head-hardened alloy rail is also offered which the company believes should provide about 20% more wear resistance than its carbon HH rail. Head hardnesses considerably above typical alloy rail figures are cited for both.

Algoma steel, currently producing alloy premium rail, has its research organization

Sydney's catalogue includes two premium-hardness alloy-steel rail options—columbium (niobium)-chrome or chrome-moly—of similar properties. It produces either vacuum-degassed or controlled-cooled rail as specified and supplements ultrasonic inspection with magnetic particle inspection to eliminate base seams. Present rail production is from hot-topped ingot steel, although a continuous caster has been in service when production warrants.

It's generally agreed that both hardened carbon and alloy rail of proper formulation and manufacture can be made hard enough to reduce curve wear to a degree worth the premium while remaining tough enough for safety—but that margin has to be watched carefully.

● **Focus on fracture.** Designing a structure to last forever is essentially a matter of proportioning it so that no frequently-repeated service loads stress the material beyond its fatigue limit. Although scatter in laboratory tests measuring it is a problem, steel (unlike many other materials, notably aluminum alloys) typically *does* have such a limit—a value below which stress cycles repeated to the practical limits of test time and money simply don't generate fatigue failures. If working stresses are above this limit, fatigue cracks will ultimately grow and the structure will have a finite life; whether or not this is acceptable then depends on how long and, particularly, how *predictable* this life is in relation to service life expectations, the price of alternatives, consequences of failure, and other economic and emotional/political factors.

Considered as a bridge distributing wheel loads to the cross-ties, the size and shape of today's rail sections (as refined over the years to put the metal where it can carry the load without excessive stress concentrations in such critical areas as the head-web fillet) are such that stresses are well below the fatigue limit. In the wheel contact area, however, no practical combination of larger-diameter wheels or reduced axle loading can keep stresses anywhere near the fatigue limit.

Cracks start only where there is tension; both contact stresses and residual stresses at the railhead surface resulting from cold-working by wheel loads are compressive, so fatigue cracks typically start a fraction of an inch below the surface. Eventually some will grow big enough to be potentially dangerous—and also big enough to be found at the next detector-car inspection. When the cost and disruption involved in cutting out and replacing defective sections reaches an uneconomically high level, the rail has "fatigued out" and should be cascaded downward to trackage where tonnage, speed and load conditions predict worthwhile remaining life—or disposed of if the railroad has run out of such opportunities.

It would be ideal if axle loads, rail lubrication, vehicle dynamics, rail metallurgy and the host of other factors affecting the situation

TABLE 1
NET U.S. STEEL MILL SHIPMENTS
(Thousands of Tons)

Year	Standard rails	Total steel products	Rail, % of total
1974	924	109,472	0.8
1975	1,179	79,957	1.5
1976	1,303	89,447	1.5
1977	1,109	91,147	1.2
1978	946	97,935	1.0
1979	1,122	100,262	1.1
1980	1,085	83,853	1.3
1981	907	88,450	0.7
1982	498	61,567	0.8
1983	611	67,583	0.9

Source: American Iron and Steel Institute

us a chance to show what we could do without being under too much pressure." Right from the start, it has produced roller-straightened, ultrasonically-inspected rail in 25-meter or 78-foot lengths from its state-of-the-art five-strand continuous bloom caster. Steel comes from the existing basic-oxygen-process plant. In common with Canadian and European rail mills, Wheeling-Pittsburgh has chosen to make premium-hardness rail by the alloy route (0.6% chromium, 0.2% molybdenum with manganese content reduced to about 0.6% to avoid weld embrittlement).

—Bethlehem Steel's plant at Steelton, Pa., has received an \$85-million upgrade, which went into production in January of this year. A Demag continuous caster supplied with inert-gas (argon)-stirred steel from its existing electric melting furnaces turns out three 14.6 × 23.6-inch jumbo blooms to feed its existing rail rolling lines. Remaining unique is Bethlehem's capability (established in the 1940s) for producing fully heat-treated premium-hardness rail, a massive capital improvement which it logically continues to exploit. The carbon-steel rail is now roller-

working with "a non-traditional, patented heat treating process for producing rail of superior quality." Rail is in field test; though announcement of the new product has not yet been made, comparatively low capital-equipment cost is cited as its advantage over other heat-treating methods.

British Steel is also understood to have resumed work on a residual-heat hardening process.

As appropriate in its coastal Nova Scotia location, Sydney Steel has been an exporter since 1908, experienced in rolling rail, including double-length, to UIC, AREA, AAR or other specifications in favor in any part of the world. Returning to production this month after shutdown for completion of a modernization program totaling \$96 million (Canadian) for the integrated steel producing plant as a whole, rail-making improvements include a hot-bed inspection line and added hydraulic press capacity for rail-end straightening if needed to complete the job done by its two-axis roll-straightener (said to be the first put in service in North America).

In addition to standard and high-silicon,



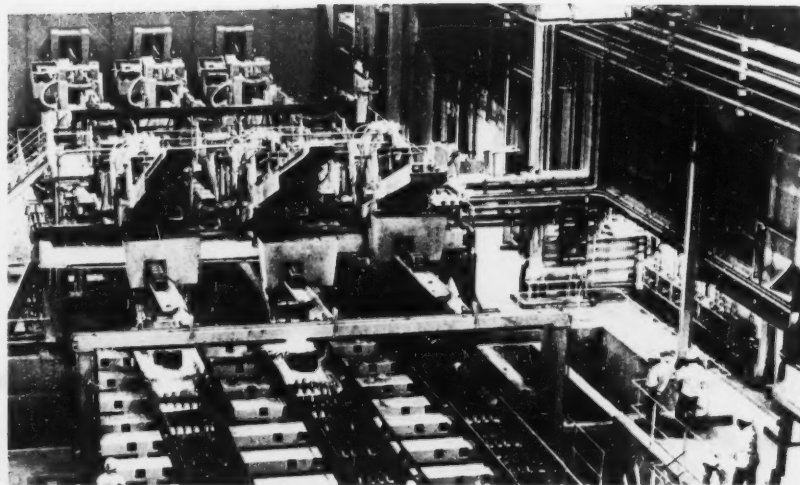
In common with Canadian and European mills, Wheeling-Pittsburgh's three-year-old mill in Monessen, Pa., produces premium-hardness alloy rail. Pictured is the company's roller straightener and hot saw.

could be so balanced that rail would reach first-service wear and fatigue limits at the same time. Is this as unlikely as running out of dip and crackers simultaneously at a cocktail party? As of now, for general-service railroading, probably yes—but researchers feel that insights on the interactions of major factors coming together from experience on single-commodity heavy-haul railroads, FAST, railroad test sites and a variety of laboratory studies and analyses will provide increasingly clear guidelines for railroad decision-makers. Some are already in hand:

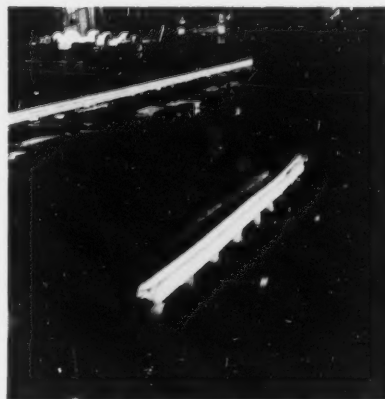
—Rail lubricant itself does not increase the growth rate of fatigue cracks, though it is true that reducing head wear by lubrication may extend rail life until the fatigue takes over as the governing mechanism.

—The *character* of head wear may be very significant in the initiation of detail fatigues; maintaining railhead contours that reduce contact between the wheel flange fillet and the gauge corner is worthwhile in some cases.

How frequently must rail of a given type under a given density and type of traffic be inspected for defects if sudden rail fracture is to be precluded? Experimentally, the rate of growth of cracks under traffic has been studied in FRA-sponsored tests at FAST by inserting rail sections with service-induced flaws of reasonably well known size, and more work of this type is planned. To the extent that the maximum growth rate of identifiable types and sizes of defects can be established, detec-



Upgrading of Bethlehem Steel's Steelton, Pa., plant was completed late last year; its most spectacular feature is a continuous caster that creates three 14.6-by-23.6-inch jumbo blooms at one time.



CF&I Steel's plant in Pueblo, Colo., was the first U.S. mill to tool up for 82-foot rail. No longer involved in basic steel production, the plant's rail now comes from scrap melted and processed in electric furnaces.

tor-car scheduling can be more rational. Analytically, AAR Tech Center's Roger Steele expects application of crack-growth math models derived from roller-bearing studies at Northwestern University to help understand how—if not at this stage *when*—cracks parallel to the surface turn in the malignant transverse direction.

• **Fracture mechanics.** Examining all routes toward the *elimination* of sudden rail failures and the big-ticket accidents they still occasionally cause (see box) also requires continuing examination of what such relatively new disciplines as *fracture mechanics* can contribute toward determining whether or not a particular class of rail defect may suddenly cause a catastrophic failure.

Fracture mechanics, advanced greatly by studies in the aftermath of highly visible ship break-in-two's during and after World War II,

has the basic goal of determining the geometric, material, environmental and stress conditions under which a crack suddenly becomes "self-powering" and zippers through a structure at fantastic speed (in steel, about 3,000 feet per second). Oversimplifying a subject which has been developed only with aid of the most advanced experimental and analytical techniques, it has been rather well established that:

—*Fracture toughness* of a given material (as measured in terms of the energy required to break off a cracked specimen) is the important indicator of its ability to resist sudden failure. Fracture toughness typically falls from normal to a value many times lower over a rather narrow "ductile-to-brittle transition" temperature range.

—For any given structure size, geometry, material and stress condition, there is a certain *critical flaw size*. Only when this is exceeded will sudden catastrophic cracking occur.

Structures such as bridges, ships—and freight cars—can avoid unpleasant brittle failures by specifying (and paying for) material whose transition temperature is below the lowest expected in service; low-quality mild steel may have a transition temperature above freezing but modest alloying (nickel) and control of other metallurgical factors can push it below Arctic requirements.

Carbon steels of rail hardness, on the other hand, have transition temperatures in the range of 275 degrees Fahrenheit and so are operating in their "brittle" regime throughout the year. Adequate fracture toughness is thus a must; the standard AREA physical tests do not directly measure this, but it is characteristic of the classes of rail steel whose level of performance has been demonstrated in service over the years and whose heat-to-heat uniformity is verified by the tests.

Why do cold snaps in the -30-degree Fahrenheit range result in so many broken

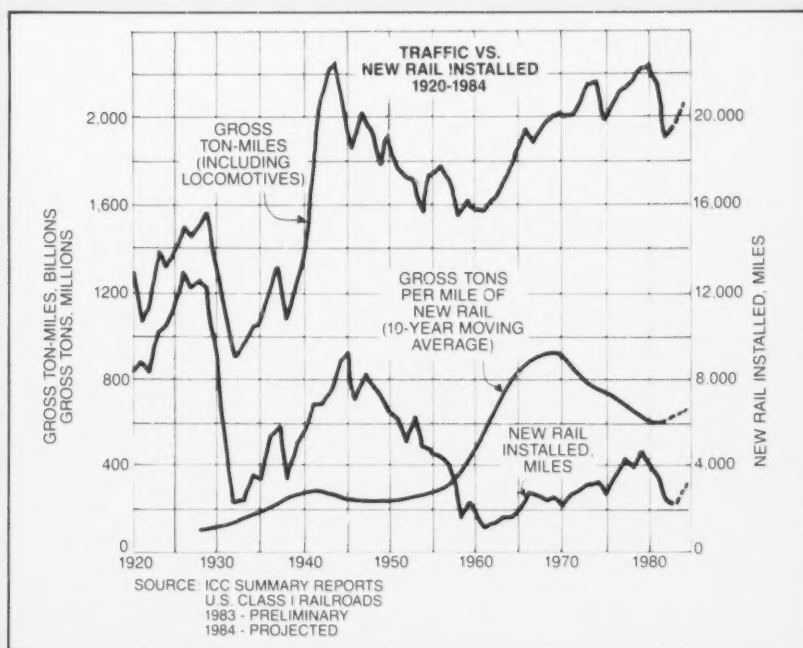
Does rail last like it used to?

Have fatigue and other effects of heavier axle loads proven so damaging to rail life that its tonnage-carrying efficiency is declining despite such favorable factors as elimination of rail-end batter by cwr, increased attention to rail grinding and the general upgrading of maintenance of way in recent years?

The accompanying chart plots the 1920-1984 history of rail life on U.S. railroads in terms of gross ton miles of traffic per mile of new rail installed, including locomotives and considering passenger- and freight-train gross tons equivalent in effect on rail life.

Since overall track wear in terms of total traffic in gross ton miles is independent of the length of line over which it is spread and new steel is commonly injected into the system when main-line rail has served out its first life whether or not it can be cascaded, the result is generally comparable to the familiar MGT number used in comparing or estimating rail wear and tear on individual track segments. In order to clarify trends, short-term fluctuations in traffic and corresponding curtailments in new-rail programs which faithfully (if sometimes counterproductively) follow them have been smoothed out by plotting the 10-year moving average.

In the absence of a good measure of the overall condition of railroad properties for evaluating the effect of extended periods of deferred or augmented maintenance, it may still be too soon to conclude that effects of introduction of the 100-ton car in the 1960s are fully reflected by the moving averages (projected through 1984) presented. Nevertheless, it appears that today's rails are surviving more



than twice the 250-300 MGT sustained during a similar period of rebuilding in the late 1940s under 50- and 70-ton cars, and at least five times that typical of the 1920s when the 40-ton car was most prevalent. It is also apparent from results in the field that the rails of the 1960s could not endure 800+ MGT without serious degradation under the maintenance conditions of the time.

These MGT-based figures also somewhat understate the freight-carrying efficiency of today's system since the ratio of net to gross ton-miles increased more than 20% between 1930 and 1980.

What may such factors as perfected wheel lubrication and harder, tougher rail do to these numbers—and rolling mill tonnage—in the 1990s?

rails? Current belief is that the governing factor is the increase in track stiffness and resulting impact loading from the extremely hard-frozen roadbed; the unattractive palliative remains the same—slow orders until the temperature rises.

• **Staying out of the danger zone.** So, rail is a critical structure which must work in the brittle range of its material, at stress levels which insure the generation of some internal fatigue cracks in service. If cracks are detected before they reach critical size, the situation is at least stable. Can that situation be retained with harder, more wear-resistant rail?

In the case of some structures such as light weight pressure vessels which are of simple geometry, it has been possible to use ultra high strength materials of low fracture toughness by insuring that under the precisely known conditions of loading, the critical crack dimension is larger than the thickness: A developing crack will reveal itself as a leak before a rupture can occur. Such a hair-raising procedure doesn't fit rail loading, but clues to

maintaining a margin of safety abound in a recently-released report of the FRA task force examining last November's shattered-rail derailment of Amtrak Train 21 running on the Missouri Pacific near Marshall, Texas.

What happened was a result of an egregious maintenance situation: The end of a Krupp chrome-vanadium alloy-steel rail, flame-cut in the field and projecting $\frac{1}{8}$ inch above a carbon-steel rail to which it was bolted in emergency repair of a pull-apart, survived passage of a freight train at 52 mph. But it shattered over 33 feet into more than 90 separate fragments when struck by a train traveling somewhat below full 79-mph track speed. Calculated impact load was 240,000 pounds with a duration of 0.4 millisecond. Material test results conducted to date indicate that fracture toughness of this rail (representative of about 340 track miles of generally similar composition currently in service in the U.S.) is approximately half that of standard carbon steel and more typical domestic chrome-molybdenum alloy rails.

Is such alloy steel usable? The FRA task force noted that a more typical 10-mph slow order over such a repair would still provide ample margin against such a failure mode and recommended long-term research in such areas as residual rail stress and fracture toughness. It concluded that "there are no inherent reasons why acceptable combinations of manufacturing, operating, and maintenance practices cannot result in the safe use of alloy rail." It can be done, but it will take some doing.

• **A "barrel of youth" for rail?** Since sound, reliable welds and their adjacent heat-affected zones in pre-nium alloy or heat-treated cwr still tend to have different microstructure and wear characteristics than the parent rails, leading to the development of bumps or dips in service, the AAR Technical Center in Chicago has been investigating the practicality of post-welding heat treatment. A 15-rail string welded in its experimental barrel furnace at the Selsco Corp. of America plant in Dresher, Pa., is entering field test on a curve in

Cajon Pass where 60 MGT of Santa Fe and UP traffic will rapidly check out its uniformity and wear rate.

Rail heat treatment during this first developmental phase has been done in two separate passes through the furnace, hardening with a polymer alcohol/water spray (similar in cooling rate to an oil quench) followed by a five- to six-minute tempering at 1,175 degrees Fahrenheit resulting in surface hardness of 340 to 360 Brinell. Experience with the rig has defined improvements to be incorporated in a second-phase pilot-production model. To be located near some participating railroad's welding plant (currently unselected, with more than one road expressing interest in playing the host), it will be designed to quench and temper in one pass.

Reasons behind increasing enthusiasm on the part of project leader Dan Stone and other railroad and AAR rail researchers for the barrel furnace's potential are several:

—Not only is weld-area microstructure improved but the reheat temperature, only 200 to 300 degrees below the final rolling temperature in the rail mill, results in grain refinement and better toughness throughout than that in new controlled-cooled rail.

—Running relay cwr through the barrel-furnace cycle can remove its accumulated fatigue history, in effect restoring its youth and shifting wear/fatigue life relationships back

toward those typical of the era of lower axle loads.

—Practical logistic precedures for returning, selecting and reassembling cwr into high-quality strings for relay have been demonstrated to exist, as at Southern's Atlanta plant.

• **The corrugation question.** Another persistent rail problem, with implications for the rest of the track structure as well, is its tendency to develop corrugations. The remedy for these undulations in the rail surface is available and in service in the form of the familiar contractor-operated or railroad-owned cars or trains with controls of ever-increasing finesse and a cost of a few hundred dollars per pass-mile. These machines use anywhere from 16 to 120 stones to grind away enough metal to restore the rail surface.

The good news is that a study by A.M. Zarembski, former track research manager for the AAR and now Speno Rail Services director of R&D, indicates that every dollar put into grinding rail before the corrugations have reached a depth (about 0.05 inch) where impact loads are significantly increased saves at least eight dollars in rail life, tie, ballast and track surfacing costs. And others knowledgeable in the field but without his reason for bias believe that his predictions are conservatively based and probably understate the benefit ratio.

Also on the good-news side is the idea, brought into practicality by the availability of such voracious grinding rigs and being used or tested in Australia, Canada and elsewhere, of creating *asymmetrical railhead contours* so that wheel tread conicity may be effective in rolling wheels around mild (up to two- or three-degree) curves with significantly less flange contact and rail wear under heavy-haul conditions.

The bad news is that so far no theory explaining the mechanics of rail corrugation has proven valid in a wide enough set of circumstances to lead the way to preventing it in the first place. A major corrugation experiment completed at FAST has provided a body of well-recorded data which will remain valid for use in further studies of the problem and offers some guidelines which may be helpful in not-too-different conditions elsewhere, though the results themselves provided mostly surprises. At FAST, rails above a certain hardness generally didn't corrugate; but a recent British Rail paper on the subject mentions that they find that harder rail corrugates more than soft.

All things considered, today's steel rail remains one of the best-understood and, for the punishment it receives, most reliable of engineering artifacts—but that doesn't mean it is about to run out of "opportunities" for research. ■

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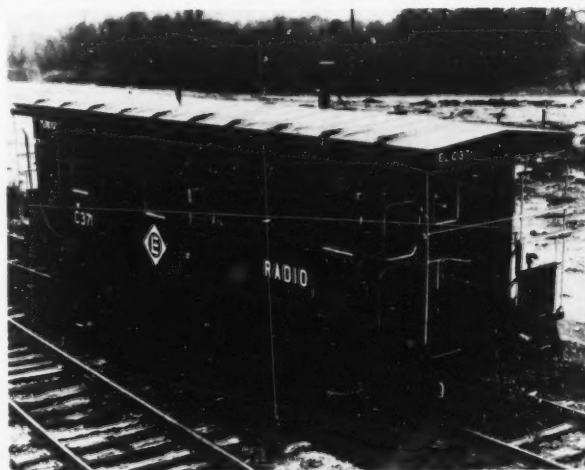


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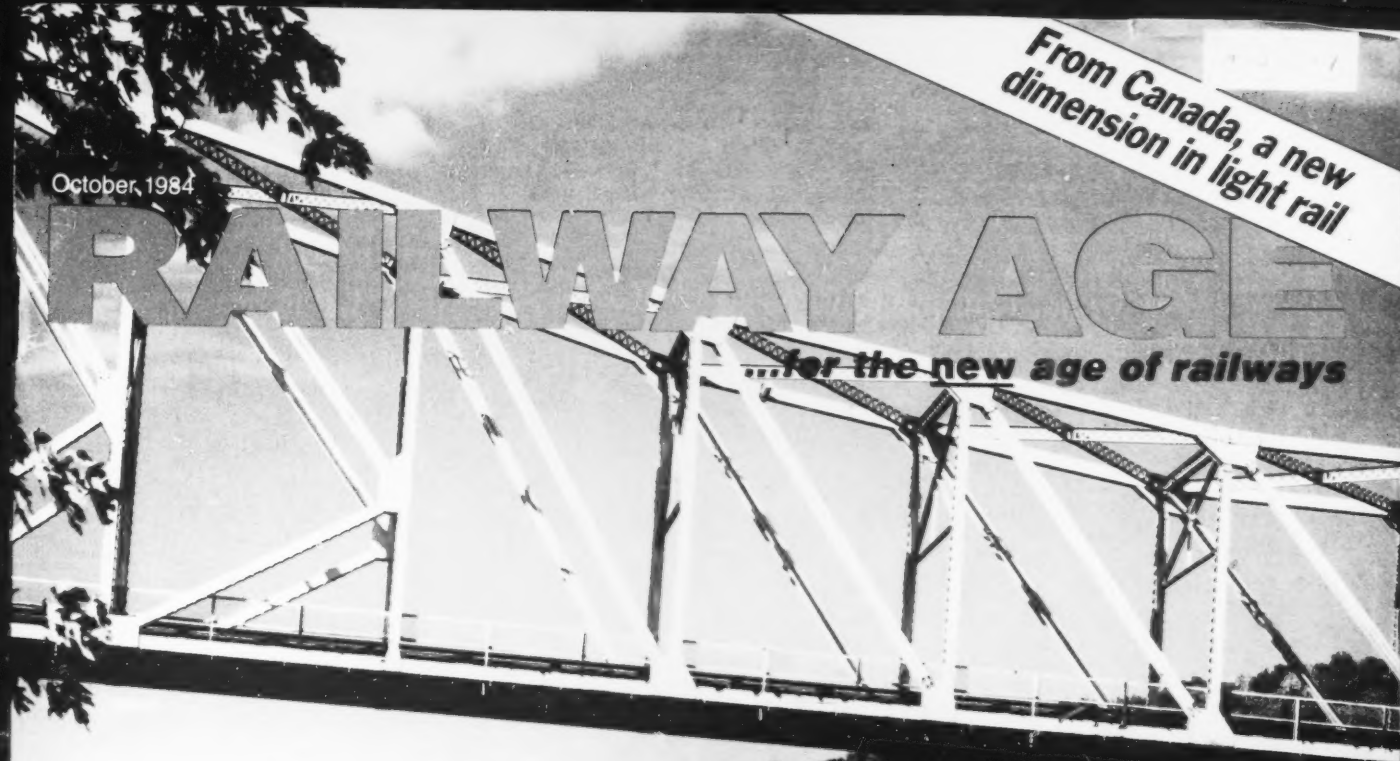
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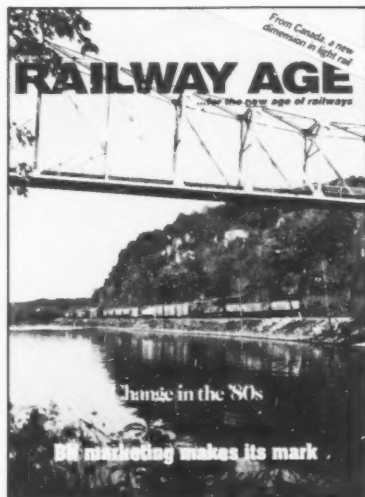
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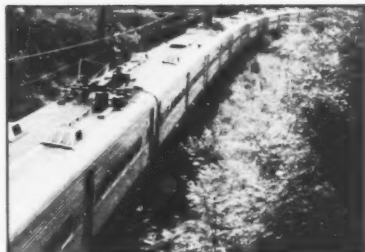
...for the new age of railways



Cover: BN train along the Mississippi River near Savanna, Ill., photographed by David W. Franzen. *Page 32*



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56 M&E: Re-electrification and rebirth

New Jersey Transit has completed the re-electrification of its Lackawanna commuter routes, now officially called "the new" Morris & Essex Lines.

64 ICTS: A tale of three cities

Canada's Intermediate Capacity Transit System—a new dimension in light rail—will be tested in revenue service soon in Toronto, Detroit, and Vancouver.

71 CTA forges rail-air link

The 17.5-mile rail link from downtown Chicago to O'Hare Airport is in operation; the Chicago Transit Authority expects daily ridership to reach 42,000.

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Inside

The BN and the Black River

Physically speaking, the 29,000-mile Burlington Northern and the 20-mile Black River & Western have very little in common except their track gauge. But there is one striking similarity: Each road is working hard to expand its markets through an extended intermodal reach. BN's highly sophisticated efforts are described in Associate Editor Frank Malone's cover story, which starts on p. 32. BR&W's more rustic, though highly successful, thrust is an important part of the rather remarkable short-line success story that begins on p. 41.



LUTHER S. MILLER

Not so many happy returns

The fact that the railroads are performing so much better than they have performed in many years has led to the perception in some quarters that they have turned into money machines on wheels. That, alas, is not the case.

The Interstate Commerce Commission's latest road-by-road return on investment report suggests that the railroads still have a long way to go before their earnings approach the cost-of-capital benchmark that the ICC has determined to be a reasonable measure of revenue adequacy. (The cost of capital is now estimated at around 15%.)

As an industry, the Class I freight railroads reported a 4.94% return for the 12 months ended March 31, 1984; some were higher, some were lower, and some did not make a return at all. For the record, this is how individual roads performed:

Southern District:

Florida East Coast	0%
Illinois Central Gulf	1.95%
Seaboard System	6.21%
Southern	4.86%

Western District:

Santa Fe	4.54%
Burlington Northern	8.46%
Chicago & North Western	6.05%
Milwaukee Road	0.92%
Denver & Rio Grande Western	3.02%
Duluth, Missabe & Iron Range	2.39%
Kansas City Southern	7.17%

Missouri-Kansas-Texas	5.91%
Missouri Pacific	5.40%
St. Louis Southwestern	2.06%
Soo Line	3.50%
Southern Pacific	1.36%
Union Pacific	4.01%
Western Pacific	0%

Eastern District

Baltimore & Ohio	1.67%
Bessemer & Lake Erie	2.69%
Chesapeake & Ohio	5.63%
Conrail	7.19%
Elgin, Joliet & Eastern	4.32%
Grand Trunk Western	0%
Norfolk & Western	5.98%
Pittsburgh & Lake Erie	0%

Market Outlook

Equipment

CP Rail: Placed orders with National Steel Car Limited to build 50 70-ton-capacity ballast cars, valued at \$5 million; and to equip 60 tri-level and 25 bi-level autocars with fully-enclosed racks, another \$5-million order.

Electric Fuels (Florida Power): Ordered 120 four-pocket aluminum auto-dump hopper cars from Greenville Steel Car for delivery in this year's fourth quarter. The cars will have conventional steel underframe and aluminum superstructure, capacity of 4,140 cubic feet, lightweight of 552,900 pounds, and a load limit of 105 tons. The design incorporates the Miner Auto-Mech door operating system.

Grand River Dam Authority of Oklahoma: Ordered 120 Bethlehem Coalporter cars from Bethlehem Steel Corp.'s Freight Car Division. Production was scheduled to begin in mid-September following completion of an order from Wisconsin Power & Light Co. for 127 of the high-capacity gondola cars, plus "tack-on" orders for eight cars. Although nearly 4,000 Coalporters are now in use throughout the country, this is the first order placed by the Grand River Dam Authority.

Facilities

Seaboard System: Will spend \$12.5 million to consolidate two existing yards at Savannah, Ga., into an expanded and modernized facility at the site of Southover Yard. Scheduled for completion in 1985, the project calls for construction of 13 new classification tracks, a new connecting track, extension of the double track main line two miles south of the yard to the Little Ogeechee River Bridge, construction of a new yard office building, a new mechanical repair facility and a new base to service locomotives. Seaboard also plans to consolidate and modernize yard operations at Augusta, Ga., at a cost of \$3.5 million.

Freight cars

	DELIVERED				
	1984	1983	1984	1984	1983
Built new by carbuilders	1,300	469	1,327	7,615	3,016
Built new in RR shops	0	0	0	0	200
Built new—total	1,300	469	1,327	7,615	3,216
Rebuilt	0	71	0	0	100
TOTAL DELIVERED	1,300	540	1,327	7,615	3,316

	ORDERED				
	1984	1983	1984	1984	1983
To be built new by carbuilders	785	287	607	11,581	3,748
To be built new in RR shops	0	0	0	250	3
To be built new—total	785	287	607	11,831	3,751
To be rebuilt	0	0	0	0	100
TOTAL ORDERED	785	287	607	11,831	3,851

	ON ORDER AND UNDELIVERED				
	1984	1983	1984	1984	1983
To be built new by carbuilders	6,056	3,752	6,571	6,404	4,173
To be built new in RR shops	250	3	250	94	34
To be built new—total	6,306	3,755	6,821	6,498	4,207
To be rebuilt	0	0	0	0	34
TOTAL ON ORDER	6,306	3,755	6,821	6,498	4,241

Source: Transportation Div., AAR, and the American Railway Car Institute

Locomotives (new and rebuilt)

	DELIVERED		BACKLOG	
	1984	1983	1984	1983
August	59	22	September 1	225
July	93	11	August 1	159
Eight months	343	158	Average	165

Source: Transportation Div., AAR

Estimated ownership—all revenue freight cars

August 1, 1984 vs August 1, 1983

		Box		Covered Hoppers		Gondola	Hopper	Flat	Refg	All Others		TOTAL
		1984	1983	1984	1983					1984	1983	
Class I RRs	1984	257,152	160,888	125,401	274,247	84,844	51,480	21,192	975,204			
	1983	277,472	163,714	130,051	287,770	84,358	54,559	22,444	1,020,368			
Class II & S&T Cos.	1984	48,479	9,927	9,912	11,377	4,715	3,294	3,392	31,096			
	1983	50,720	9,668	10,716	11,196	5,107	3,374	3,000	93,781			
Railbox-Railgon	1984	15,075	3,998						19,073			
	1983	15,096	3,998						19,094			
RR&C** Refgs	1984					5,855			5,855			
	1983					5,169			5,169			
Private	1984	584	126,810	28,464	22,173	53,409	1,133	183,067	415,640			
	1983	456	128,230	27,768	21,414	53,941	2,143	185,153	419,105			
GRAND TOTAL	1984	321,290	297,625	167,775	307,797	142,968	61,762	207,651	1,506,663			
	1983	343,744	301,612	172,533	320,380	143,406	65,245	210,597	1,557,517			

* Class II railroads and switching terminal companies

** Railroad owned and controlled refrigerator car lines

Source: Transportation Div., AAR

Market Indicators

Where the equipment potential is

If traffic statistics are any guide, the biggest equipment investment will continue to be in heavy-commodity cars. Statistics compiled by the Interstate Commerce Commission show that coal produced 38.2% of railroad tonnage (and 22.3% of revenues) last year, with farm products, chemicals and allied products, and nonmetallic minerals the next three biggest tonnage producers. Not reflected in these statistics, of course, is the demand for piggyback equipment, which will increase due both to rising TOFC/COFC traffic and to the changing dimensions of trailers and containers.

Railroad tonnage and revenues: Rank by major commodities (Year 1983)

Commodity	Percent of Total Tons	Percent of Freight Revenue	Rank	
			Tons	Revs.
Coal	38.2%	22.3%	1	1
Farm Products	11.0	8.9	2	3
Chemicals & Allied Products	7.7	11.5	3	2
Nonmetallic Minerals	7.5	3.1	4	11
Food & Kindred Products	5.8	8.8	5	4
Lumber & Wood Products	5.5	5.7	6	7
Metallic Ores	5.3	1.7	7	12
Stone, Clay & Glass Products	3.2	3.4	8	8
Pulp, Paper & Allied Products	2.8	6.3	9	6
Petroleum & Coal Products	2.6	3.1	10	10
Primary Metal Products	2.5	3.2	11	9
Waste & Scrap Materials	1.9	1.6	12	13
Transportation Equipment	1.7	8.6	13	5
Subtotal	95.7	88.2	—	—
All Others	4.3	11.8	—	—
Total	100.0	100.0	—	—

Source: Interstate Commerce Commission, Freight Commodity Statistics.

Revenue freight carloadings

Commodity	Sept. 15 week	% change from 1983	Sept. 8 week	% change from 1983	Sept. 1 week	% change from 1983	Aug. 25 week	% change from 1983	Aug. 18 week	% change from 1983
Grain	31,549	5.5	27,030	(0.1)	34,264	7.7	29,934	(0.3)	30,730	(4.5)
Other farm products	3,209	(13.2)	2,556	(4.8)	2,633	(8.5)	2,346	(27.5)	2,561	(27.3)
Metallic ores	17,585	21.9	16,075	20.3	18,954	30.5	20,858	10.5	19,032	16.0
Coal	133,923	14.7	117,348	18.0	134,033	22.2	134,384	24.3	131,791	19.6
Crushed stone, gravel and sand	13,642	23.5	11,128	19.2	12,868	19.5	13,651	24.7	12,834	21.0
Nonmetallic minerals	13,711	2.5	12,282	10.4	13,543	(6.5)	12,630	(0.2)	12,694	1.4
Grain mill products	10,469	(19.3)	8,908	(15.5)	10,310	(14.0)	10,323	(14.0)	10,224	(15.9)
Food and kindred products	11,201	(11.1)	9,402	(9.3)	11,139	(9.6)	10,357	(9.2)	10,848	(8.0)
Primary forest products	14,214	(2.8)	11,450	(2.4)	13,417	(5.3)	13,746	(6.2)	13,591	(7.6)
Lumber and wood products (except furniture)	7,087	(1.0)	5,449	(0.9)	7,623	2.1	7,673	2.7	7,240	1.5
Pulp, paper and allied products	15,090	(0.8)	13,383	(1.7)	14,858	(5.7)	14,551	(2.0)	14,210	(6.6)
Chemicals and allied products	25,149	3.6	23,064	9.9	25,750	2.2	24,928	5.0	25,495	9.2
Petroleum products	5,098	(2.5)	4,399	1.8	4,748	(1.2)	4,886	6.2	4,566	1.0
Stone, clay and glass products	11,780	(0.2)	10,341	2.5	11,385	(2.6)	11,475	0.1	11,275	1.5
Coke	5,095	(8.4)	4,628	(16.4)	4,747	(16.2)	4,873	(15.4)	5,110	(10.5)
Metals and products	8,052	(2.4)	6,894	0.6	9,098	1.1	7,979	(11.4)	8,225	3.1
Motor vehicles and equipment	21,008	15.6	15,728	12.8	19,135	(0.3)	18,350	21.9	17,053	19.9
Waste and scrap materials	9,780	8.2	7,305	9.9	8,933	9.1	8,950	11.1	8,765	8.4
Forwarder and shipper assn. traffic	7,659	(9.2)	6,339	(8.1)	8,047	(20.4)	7,752	(8.4)	7,251	(9.4)
All other carloads	59,747	6.9	50,398	9.4	59,969	9.6	59,085	9.4	57,164	8.1
LCL traffic	64	(39.7)	168	(18.8)	144	(55.7)	178	(35.3)	115	(56.3)
Total Cars Loaded	425,212	6.6	364,275	8.3	425,598	8.3	419,409	8.9	410,774	7.4

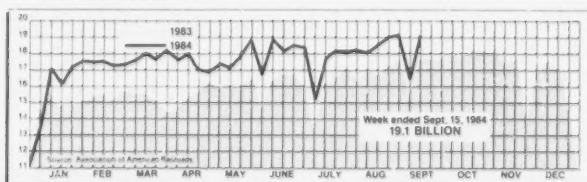
Estimated revenue ton-miles (billions)	1984	1983	% change from 1983
37 weeks	664.0	576.9	15.1

Piggyback loadings

Week ended	Cars loaded		Trailers/containers	
	1984	% increase from 1983	1984	% increase from 1983
August 11	50,900	11.1	87,774	9.3
August 18	51,327	10.5	87,200	7.3
August 25	53,073	10.3	90,001	7.1
September 1	54,203	9.8	92,609	6.0
September 8	47,452	15.4	79,304	11.1
Cumulative total, 36 weeks	1,820,504	15.7	3,138,941	15.3

Rail freight traffic trends

Billion ton miles (Estimated)



REVENUES AND EXPENSES OF RAILWAYS

Second quarter figures of calendar year 1984

(Dollar figures are stated in thousands, i.e., with last three digits omitted)

		Operating revenues				Operating expenses				Operating Ratio		Income after fixed charges		Net income	
		Freight		Other		Way & structures		Equipment		1984	1983	1984	1983	1984	1983
		Total	1983	Total	1983	Total	1983	Total	1983						
		1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983	1984	1983
Amtrak	3 mos.	186,673	186,673	168,952	168,952	65,114	37,462	29,250	88,058	20,090	390,613	337,000	209,24	199,46	(200,096)
	6 mos.	346,078	346,078	315,905	315,905	131,934	76,149	58,502	178,262	40,016	776,813	678,383	224,46	214,74	(420,234)
Atchafalaya, Topeka & Santa Fe	3 mos.	561,716	12,126	573,842	506,610	84,751	77,663	14,968	132,263	120,517	23,626	519,867	470,277	92,82	51,763
	6 mos.	1,134,413	21,128	1,155,541	992,530	169,954	154,944	29,648	274,048	244,227	47,303	1,052,944	954,094	96,12	98,768
Baltimore & Ohio	3 mos.	271,270	10,641	281,911	230,643	45,913	67,122	9,881	59,636	55,540	7,287	250,915	246,141	89,00	106,71
	6 mos.	526,260	21,009	547,269	426,712	90,905	100,362	19,730	118,132	109,915	14,517	502,482	447,953	91,81	104,97
Bessemer & Lake Erie	3 mos.	18,614	7,032	25,646	19,908	3,785	2,840	1,410	1,844	1,946	1,066	17,157	13,767	66,89	69,15
	6 mos.	29,977	8,730	38,707	30,210	7,428	5,644	2,698	3,607	3,922	2,140	32,767	29,446	84,65	97,47
Boston & Maine	3 mos.	30,374	1,550	31,924	30,157	4,783	5,207	614	9,359	8,669	(213)	29,772	30,574	93,25	101,38
	6 mos.	60,155	2,950	63,105	57,652	8,866	10,417	795	18,851	17,017	108	59,574	60,456	94,40	104,86
Burlington Northern	3 mos.	1,071,554	24,226	1,095,780	943,392	153,688	221,888	39,726	198,723	174,748	14,949	865,587	865,873	78,99	91,78
	6 mos.	2,172,543	47,255	2,219,798	1,936,708	304,946	375,919	76,787	396,668	353,733	31,160	1,767,844	1,708,713	79,63	88,22
Chesapeake & Ohio	3 mos.	291,671	11,941	303,612	247,932	35,839	62,182	8,071	64,708	52,577	3,779	238,838	225,369	78,66	90,89
	6 mos.	533,485	18,054	551,539	458,867	73,304	90,607	16,105	122,963	102,940	7,036	469,071	420,755	85,04	91,69
Chicago & North Western	3 mos.	196,933	25,863	222,796	208,925	31,161	38,879	5,436	51,389	47,504	4,380	201,412	196,651	90,40	94,12
	6 mos.	403,729	51,671	455,400	405,856	68,422	71,442	11,393	108,319	96,630	8,862	424,386	389,408	93,18	95,94
Chicago, Milwaukee, St. Paul & Pac.	3 mos.	107,200	3,923	111,123	89,607	21,916	21,568	5,899	31,746	24,953	3,133	107,928	94,972	97,12	105,98
	6 mos.	208,193	7,582	215,775	176,584	41,581	34,872	11,807	62,706	48,941	6,015	212,100	178,392	98,29	101,02
Conrail	3 mos.	838,422	32,459	870,880	766,216	115,363	168,830	20,481	185,557	178,314	34,946	696,904	730,969	80,02	95,39
	6 mos.	1,649,465	62,099	1,711,564	1,484,230	247,342	288,889	42,911	384,025	367,860	70,918	1,452,785	1,432,265	84,88	96,49
Delaware & Hudson	3 mos.	30,389	1,225	31,624	28,031	5,535	4,998	365	8,806	8,004	(16)	31,483	28,265	99,55	100,82
	6 mos.	58,140	4,075	62,215	52,014	10,478	9,500	401	18,226	15,817	418	61,342	55,684	101,76	107,05
Denver & Rio Grande Western	3 mos.	92,065	1,181	93,246	76,264	14,603	13,663	2,959	18,052	16,688	3,115	83,980	74,679	90,04	97,92
	6 mos.	178,688	2,773	181,461	145,948	28,546	22,982	5,715	35,046	30,869	6,221	164,738	138,349	90,78	94,79
Duluth, Missabe & Iron Range	3 mos.	25,152	1,725	26,877	23,446	8,236	5,909	1,650	2,356	2,072	613	21,634	16,375	80,49	69,84
	6 mos.	39,473	2,041	41,514	32,856	14,818	10,689	3,142	5,120	4,313	1,407	40,339	30,477	97,16	92,75
Eign, Joliet & Eastern	3 mos.	17,833	8,804	26,637	23,651	4,356	3,638	631	5,440	2,931	2,031	23,639	21,715	88,74	91,81
	6 mos.	36,178	18,016	54,194	45,420	7,466	6,106	1,315	8,641	5,665	3,910	46,505	41,004	85,81	90,27
Florida East Coast	3 mos.	30,425	566	30,991	25,258	4,360	5,782	1,127	4,796	3,727	759	21,774	20,428	70,25	80,87
	6 mos.	61,204	961	62,165	50,877	8,724	10,788	2,259	10,168	7,589	1,881	44,259	40,119	71,19	78,85

Grand Trunk Western	3 mos	80 845	4,911	85,756	59,936	10 115	8,326	1,749	19,045	11,974	1,611	82,619	56,522	96,34	94,30	1,199	2,175	3,630	1,676	2,303
	6 mos	161,161	9,148	170,309	112,038	20,257	14,748	3,496	38,526	24,190	3,209	166,131	113,413	97,54	101,22	756	(3,429)	6,183	2,743	(1,973)
Illinois Central Gulf	3 mos	221,901	19,186	241,087	215,811	29,234	33,006	11,508	67,530	65,271	4,973	224,733	216,682	33,21	100,40	14,899	(5,752)	14,439	12,940	(6,122)
	6 mos	455,400	40,109	495,509	439,514	59,216	56,707	23,021	140,010	136,220	10,015	461,623	433,455	93,16	98,62	30,039	(5,529)	30,291	26,120	(6,229)
Kansas City Southern	3 mos	76,973	4,065	81,038	76,693	12,406	14,686	3,703	18,803	17,847	5,408	69,274	67,861	85,48	88,48	9,659	6,869	8,295	6,161	4,725
	6 mos	155,638	7,733	163,371	151,626	24,473	27,895	7,739	39,309	36,153	10,451	140,468	135,760	85,98	89,53	18,605	12,834	15,951	11,599	9,192
Missouri-Kansas-Texas	3 mos	68,282	3,269	71,551	58,355	13,527	9,020	2,586	18,390	14,585	1,594	67,089	52,387	93,76	89,77	2,004	3,753	4,918	2,004	3,753
	6 mos	134,009	6,804	140,813	113,684	24,910	17,188	5,176	35,386	27,370	3,148	131,205	102,945	93,17	90,55	4,933	6,143	10,319	4,933	6,143
Missouri Pacific	3 mos	439,576	11,833	451,409	408,496	65,911	80,987	11,901	102,059	85,410	17,633	402,402	377,062	89,14	92,30	45,810	16,453	38,761	33,087	11,377
	6 mos	871,321	23,201	894,522	822,501	126,373	142,307	23,835	198,642	186,402	35,848	794,271	751,034	88,79	91,31	88,354	43,730	78,821	62,087	28,189
Norfolk & Western	3 mos	437,516	17,085	454,601	386,386	74,324	91,351	10,355	84,913	69,442	13,227	360,679	337,483	79,33	87,34	125,136	71,262	52,058	77,290	43,058
	6 mos	859,530	32,955	892,485	733,804	154,381	165,843	20,867	167,636	140,911	26,498	721,805	668,351	80,87	91,08	225,292	106,958	87,383	134,744	65,721
Pittsburgh & Lake Erie	3 mos	16,499	432	16,931	10,445	1,749	1,608	314	3,155	4,441	359	14,715	14,139	86,91	135,36	(944)	(6,642)	2,220	(944)	(6,642)
	6 mos	27,847	861	28,708	19,927	3,442	3,469	559	7,328	9,468	719	28,675	29,682	99,88	148,95	(5,328)	(15,044)	40	(5,328)	(15,044)
St. Louis Southwestern	3 mos	111,728	1,197	112,925	90,557	12,860	12,524	4,248	26,876	22,632	5,550	100,305	81,803	88,82	98,33	16,482	11,173	7,398	11,260	4,563
	6 mos	221,506	2,623	224,129	174,669	27,248	23,340	8,447	55,179	43,234	11,125	198,288	159,740	88,47	91,45	31,530	16,582	15,560	21,249	8,288
Seaboard System	3 mos	683,753	13,747	699,500	603,223	87,132	118,728	16,810	173,590	160,415	15,593	597,278	588,000	85,38	97,47	104,969	12,174	71,538	70,992	12,204
	6 mos	1,376,662	20,467	1,407,129	1,209,797	169,472	205,564	32,327	339,716	314,737	31,025	1,187,582	1,145,013	84,39	94,64	221,314	51,924	150,748	146,550	47,794
Soo Line	3 mos	70,151	1,707	71,858	66,480	16,163	14,923	2,844	16,654	16,108	2,017	70,890	66,909	98,65	100,64	2,801	(150)	675	1,589	38
	6 mos	151,819	3,574	155,393	133,165	29,811	25,968	5,670	36,038	32,042	4,051	146,966	129,847	94,57	97,50	10,150	3,643	5,158	6,489	2,378
Southern	3 mos	453,080	9,497	462,577	408,910	60,560	71,770	17,289	91,204	83,375	19,234	359,744	347,654	77,76	85,01	102,866	58,415	62,124	60,083	40,225
	6 mos	885,639	19,673	905,312	792,115	122,328	120,805	34,241	181,504	162,778	37,802	719,975	670,997	79,52	84,70	183,797	111,258	112,129	106,635	70,340
Southern Pacific	3 mos	544,238	16,572	560,810	497,068	54,586	84,412	21,377	159,617	138,146	21,187	551,213	510,316	98,28	102,66	16,441	(5,488)	24,051	30,895	(9,213)
	6 mos	1,074,215	34,024	1,108,239	959,566	116,630	168,473	42,165	322,693	268,149	42,238	1,100,918	1,010,497	99,33	105,30	32,189	(43,551)	34,941	59,809	(43,552)
Union Pacific	3 mos	462,037	6,866	468,903	422,204	69,292	79,995	16,966	103,395	87,604	23,546	421,164	400,563	89,81	94,87	46,141	28,043	33,238	31,586	18,406
	6 mos	958,492	12,844	971,336	867,294	143,570	139,546	33,799	217,803	181,464	47,162	877,544	799,786	90,34	92,21	88,121	66,327	64,094	58,321	41,988
Western Pacific	3 mos	38,562	697	39,259	36,999	5,600	6,492	729	8,491	9,750	1,756	38,320	42,939	97,60	116,05	(1,245)	(3,470)	2,847	246	(1,899)
	6 mos	77,089	1,374	78,463	77,810	12,859	13,156	1,458	17,342	20,518	3,584	81,963	89,852	104,46	115,47	(8,354)	(7,219)	1,688	(3,263)	(3,931)

Source: Interstate Commerce Commission

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